OPERATION AND MAINTENANCE MANUAL

ROCKAWAY BOROUGH WELLFIELD SUPERFUND SITE
KLOCKNER & KLOCKNER SOURCE AREA - OPERABLE UNIT 3
BOROUGH OF ROCKAWAY, NEW JERSEY
EPA IDENTIFICATION NO. NJD980654115

TRC Job No. 163292

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List of Acronyms

acfm	-	Actual cubic feet per minute
bgs	-	Below ground surface
CD	-	Consent Decree
cfm	-	Cubic feet per minute
COC	-	Contaminants of Concern
CRZ	-	Contamination Reduction Zone
cm^2	-	Square centimeter
CQAPP	-	Construction Quality Assurance Project Plan
yds^3		Cubic yards
DGA	-	Dense Graded Aggregate
DIR	-	Daily Inspection Report
ECDI	-	East Coast Drillers Incorporated
EM	-	Electromagnetic Induction
EPA	-	United States Environmental Protection Agency
ft^2	-	Square feet
ft^3	-	Cubic feet
GAC	-	Granular Activated Carbon
GPR	-	Ground Penetrating Radar
HASP	-	Health and Safety Plan
ID		Inside Diameter
IGWSCC	-	Impact to Groundwater Soil Cleanup Criteria
IW	-	Inches of Water
K&K	-	Klockner and Klockner
lbs	-	Pounds
mg/kg	-	Milligrams per kilogram
MPR	-	Monthly Progress Report
$\mu g/m^3$		Micrograms per cubic meter
NJDEP	-	New Jersey Department of Environmental Protection
No.	-	Number
O&M	-	Operation and Maintenance
OU	-	Operable Unit
PCE	-	Tetrachloroethene
PDI	-	Pre-Design Investigation
PM	-	Project Manager
PVC	-	Polyvinyl chloride

RA	-	Remedial Action
RCRA	-	Resource Conservation and Recovery Act
RAO	-	Remedial Action Objective
RAR		Remedial Action Report
RAWP/SMP		Remedial Action Workplan and Site Management Plan
RCA		Recycled Concrete Aggregate
RDR	-	Remedial Design Report
RDCSCC	-	Residential Direct Contact Soil Cleanup Criteria
RDWP	-	Remedial Design Work Plan
RG	-	Remediation Goal
RI/FS	-	Remedial Investigation/Feasibility Study
ROD	-	Record of Decision
ROI	-	Radius of Influence
scfm	-	Standard cubic feet per minute
SOW	-	Statement of Work
SCFM	-	Standard cubic feet per minute
SVE	-	Soil Vapor Extraction
System	-	SVE Vacuum/Blower System
TCE	-	Trichloroethylene
TCLP	-	Toxicity Characterization Leaching Procedure
TRC	-	TRC Environmental Corporation
TRSR		Technical Requirements for Site Remediation
QA	-	Quality Assurance
QAPP	-	Quality Assurance Project Plan
QC	-	Quality Control
VET	-	Vapor Extraction Trench
VLS	-	Vapor-Liquid Separator
VOC	-	Volatile Organic Compound
VP	-	Vapor Probe

OPERATION AND MAINTENANCE MANUAL
OPERABLE UNIT 3 - KLOCKNER AND KLOCKNER SOURCE AREA
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1.0 INTRODUCTION

This document presents the Operation and Maintenance Manual (O&MM) for the full scale Soil Vapor Extraction System (SVE) at the Klockner & Klockner (K&K) Source Area – Operable Unit 3 (OU3) in Rockaway Borough, Morris County, New Jersey (hereinafter designated as the "Site") (EPA Identification No. NJD980654115).

This O&M was prepared pursuant to the Record of Decision Operable Unit Three (ROD) issued by the US Environmental Protection Agency (EPA) – Region II in September 2007 and the Consent Decree (CD) and Statement of Work (SOW) originally filed on November 20, 2009

1.1 Site Description

The Rockaway Borough Wellfield Superfund Site is located in Rockaway Borough, Morris County, New Jersey (Figure 1). Rockaway Borough is situated in the center of Morris County, approximately 10 miles north of Morristown and 20 miles northwest of Newark in the north-central portion of the state. The K&K Source Area (identified as Block 5 Lots 1 & 6 and Block 7 Lot 7) is a portion of the larger Rockaway Borough Wellfield Superfund Site.

1.2 Site History

Investigations, conducted by the New Jersey Department of Environmental Protection (NJDEP) at the Rockaway Borough Wellfield Superfund Site since 1980, indicated the presence of VOC, primarily tetrachloroethene (PCE) and trichloroethylene (TCE) in the ground water.

Due to historic operations at the K&K source area, such as rocket manufacturing, EPA determined that areas of the Site had the potential to be contaminated with TCE and other constituents. The remedial investigation/feasibility study (RI/FS) at K&K Source Area was initiated in 1995. The RI/FS included collection and laboratory analysis of soil samples and soil gas surveys to identify the on-site source(s) and delineate the nature and extent of potential contamination in the soil at the property.

The contaminants of concern detected during the soil gas survey at elevated levels were TCE and PCE. Results for soil samples revealed TCE, PCE, and lead are the primary constituents at the K&K Source Area. TCE and PCE were generally present throughout the K&K Source Area, with TCE present at elevated concentrations in the soil (up to a maximum concentration of 90 mg/kg) adjacent to Building 12.

Based on the above findings at OU3, SVE was specified as the RA at the Building 12 property in the 2007 ROD to address the on-site source of ground water contamination:

Pursuant to the ROD, TRC conducted pre-design investigation (a SVE pilot test) at the Building 12

property to determine the design parameters (air permeability, Radius of Influence (ROI), etc.) for a full scale SVE system.

The design for a full scale SVE system was presented in a final Remedial Design Report (RDR), which was approved by the EPA in December 2011.

1.3 General Process Description

The SVE system at the Building 12 property includes eleven SVE wells (SVE-1 through SVE-11), one SVE trench well (VET-1), twenty-five vapor probes, and the SVE treatment unit (Figure 2).

Using the predicted optimal flow rate and vacuum of 78 acfm and 3.5 IW, respectively (determined from the pilot test for SVE-1), the total resulting system airflow rate will be at a maximum of 936 acfm, to run all wells simultaneously. However, TRC plans to operate only four of the 12 extraction points simultaneously and rotate the operational wells. The resulting flow rate is limited by the NJDEP permit to 312 scfm, which is approximately 319 acfm.

The vapor stream extracted from the SVE wells will be treated by two 1,000-lb. Granular Activated Carbon (GAC) vessels, connected in series.

2.0 PROCESS COMPONENTS

The SVE System is comprised of the following primary components (see Figure 2)

- Vapor extraction wells and piping;
- SVE treatment unit; and
- 2 x 1,000-lb GAC vapor treatment vessels. A description of the components is presented below.

2.1 Vapor Extraction Wells, Vapor Probes and Piping

- Vapor Extraction Wells- Eleven SVE Wells and one horizontal SVE trench well are installed at the Building 12 property within the designated treatment zone. The construction details are indicated on Figure 5 and the location of the SVE wells and trench at the Building 12 property are indicated on Figure 2 and are described below:

    - Eleven SVE wells (SVE-1 through SVE-11) are installed to a depth of approximately 13 feet below ground surface (bgs). Seven SVE wells (SVE-2 through SVE-8) are located inside Building 12. Four SVE wells (SVE-1, SVE-9 through SVE-11) are located outside Building 12 in the parking lot (Figure 2). The SVE wells are constructed of 4-inch schedule 40 PVC riser and screen. The screen interval starts at 3.5 feet bgs and extends to the bottom of the well. Refer to the construction logs for further details on the wells (Appendix A).

    - One SVE trench well (VET-1) was installed outside of Building 12 to a depth of approximately 6.5 feet bgs. The SVE trench well is constructed of 4-inch schedule 40 PVC riser and screen. The 20-foot long screen is placed horizontally in the trench and is connected to a vertical riser which is finished flush to grade. Refer to the construction logs for further details on the well (Appendix A).

- Vapor Probes- Twenty-five (25) vapor probes (VP-1 through VP-25) are installed at the Building 12 property. The construction details are indicated on Figure 5 and the locations of the vapor probes at the Building 12 property are provided on Figure 2 and are described below:

    - The vapor probes are installed to depths of approximately 10 to 11 feet bgs. The vapor probes are constructed of 1-inch schedule 40 PVC riser and screen. The screen interval starts at approximately 3.5 feet bgs and extends to the bottom of the well. Refer to the construction logs for further details on the vapor probe (Appendix A).
    - Eight vapor probes (VP-15 through VP-22) are located inside Building 12, and seventeen vapor probes (VP-1 through VP-14, and VP-23 through VP-25) are located outside Building 12 in the parking lot.

- Piping- The eleven SVE wells (SVE-1 through SVE-11) and the SVE well trench (VET-1) are connected to three header pipes (see Figure 2). Interior header pipes are installed above

grade and are hung from the Building 12 ceiling. Four wells are connected to each header pipe. The connection and construction details for the header pipes are provided in Figure 5 and are described below:

- Header 1 connects four SVE wells (SVE-2, SVE-3, SVE-5, and SVE-8) inside Building 12. Header 1 transitions from 4 inch to 6 inch Schedule 40 PVC pipe inside Building 12, to reduce the friction losses due to the length of the header pipe.

- Header 2 connects to SVE-1 located outside Building 12 and to SVE-4, SVE-6, and SVE-7 located inside Building 12.

- Header 3 connects to SVE-9, SVE-10, SVE-11, and VET-1, located outside Building 12.

- The header pipes are constructed of Schedule 40 PVC inside the building and along the Building 12 wall and Schedule 80 PVC inside the trench.

2.2 SVE System Treatment Unit

The SVE system has been procured from Specialty Systems Integrators, Inc. (SSI), of Plymouth, MN. The system will be housed in a 5' x 6' skid enclosure. The primary components of the system include the SVE blower, a vapor/liquid separator (VLS) and the piping manifold. The SVE blower will be a Spencer Vortex model VB075B regenerative blower. The VLS will operate to remove any liquid conveyed to the system before reaching the blower. A small transfer pump will be installed in the system to empty the VLS tank (Figure 3).

The Process and Instrumentation Diagram (P&ID) for the system is provided as Figure 4. The P&ID shows the position of all valves and instrumentation on the system. Flow, vacuum, temperature, and pressure gauges/meters will be installed prior to delivery to the Site.

The system manifold will have 3 legs; each connected to one of the manifold pipes. Solenoid/Motorized valves will be included on the manifold to allow for automatic switching between each leg.

A manual dilution valve will be installed with the system, to allow for the introduction of fresh air into the vapor stream. This valve will be opened or closed to decrease or increase the vacuum applied to the SVE well network, allowing the blower to operate on its curve, and reducing wear to the blower motor.

Vapor treatment will be accomplished through the use of two GAC vessels plumbed in series. The discharge stack will be connected to the second vessel. Vapor monitoring will determine the VOC removal efficiency, and will aid in determining the changeout schedule.

The proposed treatment system will be capable of applying a vacuum of 3.5 IW to each extraction well, with a resulting flow of approximately 78 acfm from each well. There will be 3 header pipes (two 4-inch and one 6-inch header pipes) connected to the manifold at the SVE Treatment System

(Blower). Because the system will be plumbed in three manifold legs of four extraction points each, each leg will operate between approximately 260 and a maximum of 312 acfm. Control valves will be installed at each well and on the manifold terminations at the trailer. The system will be equipped with solenoid/motorized valves on each manifold leg to automatically rotate from leg to leg on a set timing. Only one manifold leg will be operating except during long term operational air monitoring.

A vapor-liquid separator (VLS) is also contained within the treatment unit. This VLS will prevent water from the SVE well from passing through the blower. The VLS is equipped with a transfer pump and high level cut-off switch. The transfer pump will empty the VLS is sufficient water accumulates. The high level switch will stop the SVE blower operation in the event that the transfer pump is not operating. Any collected water will be transferred to an on-site water storage vessel for sampling and disposal.

The SVE system and GAC vessels will be located within a fenced area, restricting access to designated personnel (see Figure 2).

2.3 Electrical

The following are specifications for the electrical set-up of the SVE system:

Electrical Usage (Assuming an 84% Power Factor & 92% Motor Efficiency)											
Component	Qty	HP	Voltage	Amps			Each Watts	Total Watts	KW	% Usage	Total KW (Usage)
				L1	L2	L3					
SVE Blower	1	4.8KW	240	15	15	15	4,813	4,813	4.81	100%	4.81
Transfer pump	1	0.75	240	2.8	2.8	2.8	898	898	0.9	25%	0.22
XP Heater	1		240	4.7	4.7		1,508	1,508	1.51	50%	0.75
XP Exhaust Fan	1		115	7			1,076	1,076	1.08	50%	0.54
Non-XP Exhaust Fan	1		115			7	1,076	1,076	1.08	50%	0.54
Control Panel Control Circuit	1		115			5	575	575	0.58	100%	0.58
			Total Amps:	30	23	30			9.9		7.44

Voltage: 240 VAC
Phase: 3 Phase
Power Service Recommendation: 200 Amps

Power to the system will be provided by a new electrical service, located within the system area. The control panel for the unit is located on the side of the skid mounted system. The control panel houses the electrical connections from the grid, and contains the switches and timers for the individual components.

3.0 OPERATIONS PROCEDURES

This section presents general procedures to start, operate, monitor, and shut down the SVE system.

At all times, ensure all activities are compliant with the requirements of the site-specific health and safety plan (HASP). A copy of the HASP must be available on site at all times.

All site visits should be coordinated and scheduled with the Facility Production Manager. All on-site activities, observations and weather conditions should be recorded in a site-specific field book.

3.1 SVE Treatment System Testing and Start-up

At all times during the testing and operation of the system, conditions established in the approved NJDEP air permit must be followed. A copy of the NJDEP air permit must be available on site at all times.

The NJDEP air permit can be found in Appendix B.

3.1.1 System Shakedown

The following sequence is performed by the operator to complete the 'Initial Start' step for each of the three manifold legs:

1. On the control panel turn main control panel to the "ON" position.
2. On the control panel reset any alarm conditions.
3. Calibrate Magnehelic gauges prior to start.
4. Establish air monitoring background locations at the Site; document VOC readings with a Photo Ionization Detector (PID) at these locations and test the probes
5. Run SVE blower with the dilution valve fully open, and gradually close to achieve desired flow rate. If water is drawn into the manifold, gradually open the dilution valve to determine the maximum flow rate without extracting water. (Note: Do not exceed the maximum flow rate set forth in the Air Pollution Control Pre-Construction and Certificate to Operate Permit, which is approximately 318 acfm).
6. Verify and record operating temperatures and vapor flows.
7. Record VOC readings at influent, mid-GAC, and effluent sample points on the induced vacuum/perimeter air monitoring log sheet (Appendix C).
8. After approximately 30 minutes, open the next manifold solenoid/motorized valve and close the first.
9. Determine and record the minimum dilution valve opening, and adjust the manifold control valve to achieve equal flow on all legs.

3.1.2 SVE System Initial Start-up

The following are the steps that will be implemented during the first week of operation of the SVE system, after shake down has determined the blower and GAC vessels are operating correctly.

- Step-by-step instructions are included in Table 1 of Appendix C.

- Perform one round of perimeter air quality monitoring using the PID (at background and test area locations) at the beginning and end of each step. Record data on Table 2 in Appendix C.
- As discussed above, three header pipes will be connected to the manifold at the SVE System (Blower). The SVE System will be equipped with solenoid/motorized valves which will be used to rotate between the three header pipes. The header pipes that are not in operation will be closed shut by the solenoid/motorized valve. At a given time, only one header pipe will be in operation. The SVE system will operate continuously (24 hours daily) and will be programmed to switch from one header pipe to another after every 8 hours of operation.
- The target for the full scale SVE System is to achieve a flow rate of 78 acfm by applying a vacuum of 3.5 IW at each well. The SVE system will be tuned to attain the required flow rate at each well. However, the maximum flow rate through each manifold cannot exceed approximately 318 acfm or 312 scfm, which is the NJDEP permitted maximum.
- During the SVE system operations, applied vacuum will be recorded every 30 minutes at the SVE wells, which are in operation and at the vapor probes, located in the vicinity of the SVE wells.
- Take readings by temporarily connecting the Magnehelic Gauge to the vapor probe- SVE Well adaptor, creating a tight seal and covering the rear ports on the Magnehelic Gauge. During this test, all readings should be in inches of water (IW). Please note that positive readings (pressure) may be observed and must be clearly labeled with a plus sign ("+"). Note: The Magnehelic gauge selected must be in the required incremental range for the vapor probe (i.e., 0-0.25, 0-1, 0-10, 0-20, or 0-100 IW).
- Record the applied vacuum (and air flow rate) at the extraction well every 30 minutes. Use Table 2 in Appendix C to record all readings.
- Field staff should ensure all readings are coordinated.
- Seal probes between readings.
- Adjust valves at each operating SVE well to achieve equal vacuum. The valve at the most distant well should be left open.
- Inspect the system fittings, connections and wellheads for leaks using smoke. Implement the necessary adjustments and repairs. The smoke for the tests should be generated by a spark-less device.
- Upon attaining the required flow rate of 78 acfm or 3.5 IW at each of the four SVE wells, run the system for 4 hours before switching to the next header pipe. Do not allow the system to run overnight without completing this procedure on all manifold legs.
- Repeat the same procedure for all three header pipes. Use different data sheets to document monitoring measurements for each SVE well.
- Take PID readings every half hour to one hour and in accordance with the permit requirements for influent and effluent samples. System readings should be recorded at the beginning of the test and checked every half hour. Any changes should be noted and recorded. Use Table 3 in Appendix C to record all readings.
- Collect one set of influent and effluent air samples from each manifold leg during the first week of operation. The air samples will be used to assess compliance with the NJDEP air

permit, and will be used to assess contaminant removal rates. The influent and the effluent samples should be collected in a laboratory provided stainless steel Summa canister for TO-15 analysis from the respective sample ports. The Summa canisters should be equipped with a pre-set regulator, to draw a sample over 30 minutes. The air samples should be sent to a New Jersey certified laboratory for analysis.

3.2 SVE System Emergency Shutdown and Response Guidelines

Emergency shutdown may be required under the following circumstances: power failure, recirculation system piping leaks, fitting failure causing leaks, a fire during normal operation, any potential safety hazards, the VLS tank is overfilled with liquid, or permit compliance not being attained (e.g., the flow rate exceeding 318 acfm/312 scfm at a leg; GAC breakthrough; or temperature exceedances).

The emergency shutdown sequence is as follows:

1. Push the emergency stop button on the control panel.
2. Verify Site security (fence is standing).
3. Record any alarm on the control panel.
4. Turn off the power.
5. Verify the issue that is causing the shutdown and call the Project Manager (PM).
6. Troubleshoot the problem under the PM's direction.
7. Do not turn the system back on without permission from the PM or their designee.

3.3 Planned and Unplanned Shutdowns

Several switches and sensors can initiate an automatic system shutdown if a process parameter falls outside of a preset range. These interlocks and the control logic are shown on the P&ID in Figure 4. In all cases, an alarm code will illuminate indicating each fault that was actuated, and the panel view will show a "firstout" indication of which alarm condition occurred first.

Information related to the time, cause, or corrective action(s), and any other observations related to the shutdown, should be recorded in the field book. The shutdown time will be displayed on the control panel.

4.0 OPERATION AND MONITORING

All site visits should be coordinated and scheduled with the Facility Production Manager.

During the system operation, data is collected from the vapor probes, SVE wells, the SVE system, as well as perimeter air monitoring and the data will be recorded on the Induced Vacuum/Perimeter Air Monitoring Log Sheet (Appendix C). Air samples are collected from the system influent and effluent vapor streams for laboratory analysis. Vacuum, pressure, temperature and differential pressure gauges are used to collect readings from the system and vapor probes. A hand-held PID and a multi gas analyzer are used to check ambient and process air. The multi-gas meter contains carbon monoxide, hydrogen sulfide, oxygen and lower explosive limit (LEL) sensors.

PID readings will be collected at each well head, from the installed sample port. Since the vacuum applied by the hand-held PID will not be strong enough to draw the sample against the vacuum of the SVE blowers a handheld battery operated vacuum pump will be used. This vacuum pump will operate in the range of 30 to 40 IW and will be used to collect PID readings from individual wells. The vacuum pump will be connected to the respective sample ports with Teflon tubing. The outlet from the vacuum pump will be connected to PID with Teflon tubing to collect the respective sample.

Vapor will be treated with two 1000-lb. GAC units installed in a lead-lag configuration. The contamination reduction rate from the influent stream by the two 1000-lb GAC units is anticipated to be 99%. The mid-treatment PID readings will be used to assess the adsorptive capacity of the primary GAC vessel. Change outs will occur after breakthrough (10% of influent concentration) of the first unit but before breakthrough of the second unit. When the primary vessel is spent, the GAC will be replaced, and the secondary vessel plumbed to the primary treatment location. GAC will be either re-generated or disposed of off-site by the vendor. Periodic samples may be collected from the GAC vessels to ensure proper classification and disposal.

TRC will collect three influent and three effluent samples during the first week of operation (one from each header pipe). The samples will be collected using six (6) liter Summa canisters with a one-half hour regulator. The sample canisters will be connected to the sampling ports and will be collected during the long term test operations. The samples are analyzed for the full set of target compound list VOCs, using the EPA TO-15 method. The samples are sent to Accutest Laboratories, Inc. of Dayton, NJ, a NJDEP-certified laboratory.

Equipment specific operation and maintenance (O&M), such as blower lubrication or flow meter replacement will be conducted per the manufacturer's requirements, contained in Appendix E.

Routine operations generally consist of monitoring and adjusting the process conditions to assure continued operation in the desired configuration, replacing expendable materials (such as filter elements, checking liquid levels in tanks, checking the condition of the GAC), and checking the system for abnormal conditions (such as leaks, abnormal noise, temperature, or vibration).

Routine operating and process monitoring data should be recorded on a site-specific SVE Process Data Sheet. All on-site activities, observations and weather conditions will be recorded in a site-specific field book. A detailed summary of Site monitoring procedures is provided below.

4.1 Periodic SVE System Measurements (Every Visit)

During each monthly Site operation and maintenance visit perform the following activities. They should be recorded on the System Log Sheet. Site visits should be coordinated and scheduled with the Facility Production Manager.

- Notify the Facility Production Manager of your arrival and inform him of your activities.
- Check to see that the SVE system is operating and that no alarm conditions are present.
  - If the system is not operating and there are alarm conditions present, refer to the SSI's system manual to troubleshoot. If the problem cannot be found or alleviated then call the PM.
- Check the volume of liquid in VLS tank to ensure it is not near capacity (e.g., >50% full).
  - If the VLS tank is nearing capacity, pump the fluids into the on-site holding tank.
- Record the run time of the SVE blower and the VLS transfer pump on the system log sheet (Appendix C).
- Take note of any visible damage to the system anywhere (e.g., SVE system, fencing, wellheads, etc.) and immediately notify the PM if damage is found.
- Perform a Site walk to verify that all measurement locations are not blocked by equipment or materials.
- Calibrate the rented RAE Systems Multi-RAE
  - Refer to Pine Environmental documentation for calibration instructions
  - Ensure that all calibrations are within the accepted tolerances
- Collect PID Readings from the effluent, mid-treatment and influent sample ports.
- Record system measurements on the System Log Sheet (Appendix C).

The following equipment and material should be brought to the site during each site visit:

- Multi-RAE
- Tool box
- Magnahelic gauges (scale 0-0.5 IW, 0-1, 0-10, and 0-100)
- Tubing (1/8")
- Blank log sheets
- Field book
- HASP

4.1.1 Vacuum & PID Measurements (Every Visit)

Once the above items have been performed, complete the following tasks and record on the Induced Vacuum/Perimeter Air Monitoring Log Sheet:

- Following the system measurements, proceed with gathering the induced vacuum and PID measurements from the SVE wells and Vapor Probes associated with the operating header.
  - The associated locations are grouped by header on the log sheet.
  - Measurements should be collected using a magnehelic gauge with the proper range.
  - To find the proper range, start with a higher range gauges (e.g., 0-10 inches of water).

If the reading is below the next gauge's maximum reading then move to that gauge to gather a more accurate reading.

- Hold the gauge level in both directions in order to gather an accurate measurement.

- Upon completing all of the measurements at the SVE Wells and Vapor Probes go to the SVE system trailer and switch the operation of the system to next header.
- Allow the SVE system to stabilize and start the next round of readings at the system and the SVE wells and VPs after 30 minutes.

4.1.2 Perimeter Air Monitoring (Every Visit)

Air monitoring will be conducted during each Site visit while the SVE system is operating. VOCs will be monitored with a PID.

All readings will be recorded in the field logbook. Action limits are defined in the HASP.

4.1.3 Air Sampling (Periodic)

Air samples will be collected during startup, and then on a quarterly basis thereafter. Routine air sampling procedures are outlined below.

Following the completion of all the SVE well and VP location measurements proceed with the air sampling by performing the following tasks:

- Open all three headers to the SVE system and allow the system to run for thirty minutes to stabilize.
- During the stabilization period prepare the air sampling canisters by doing the following:
  - Make sure that the Summa canisters are the larger 6 liter canisters.
  - Make sure that the flow controllers are 30 minute flow controllers.
  - Record the flow controller number and the Summa can number in the field book for the influent and effluent air samples.
  - Attach the flow controllers to the Summa canister and do not over tighten (1/2 turn past hand tight) the threaded connections since that will damage the threads.
  - Cut two new lengths of silicone tubing to attach to the influent and effluent sampling ports to use for sampling.
- Open the sampling valves without the Summa canisters connected to the tubing to allow the air flow to displace any air present in the tubing.
- Connect the sample canisters and open the flow control valves and record the initial pressure, which is in inches of mercury (Hg).
- Allow the sample canisters to collect the samples and end the sampling when the canister pressure falls below 5 inches of Hg. The effluent canisters will fill quicker than ½ hour, because the flow is under pressure.

4.1.4 SVE Liquid Sampling (Periodic)

Twice during the course of the SVE operation, liquid samples will be collected if liquids are generated. The samples will be collected directly from the storage tank using a bailer.

4.2 Typical Routine Preventative Maintenance

- Inspect and check the power source.
- Inspect all system equipment and batteries for safe working conditions.
- Inspect all accessible system fitting, connections and components for leaks and repair and adjust as necessary.
- Start up and shut down all blowers, compressor and pumps. Check all valves and inspect all gauges to ensure proper operation.
- Review the system operation manual to ensure that no components are used or operating improperly.
- Inspect GAC and plumbing and conduct preventative maintenance.
- Inspect blower in accordance with the manufacturer's manual.
- Inspect VLS pump and conduct preventative maintenance.

5.0 AIR MONITORING REQUIREMENTS

In accordance with NJDEP Permit Activity Number PCP120001 for the Klockner & Klockner Source Area (OU3), Facility ID Number 26792, the following provisions must be followed at all times:

- At all times while operating, GAC breakthrough shall be defined as: Total VOCs > 50 ppmv as Isobutylene measured between the two (2) GAC units. Total VOCs shall be monitored by periodic emission monitoring, based on 3 minute intervals using a PID/FID or equal monitoring device. The monitoring period is daily during the first week of the SVE system installation, then weekly within first month of operation and monthly thereafter. All monitoring results shall include date of meter reading, GAC column designation, effluent gas throughput (scfm), VOC meter reading (ppmv as isobutylene, and corresponding total VOC mass emission rate (lb/hour) prior to, or at breakthrough.
- Total VOCs shall be ≤ 20 ppmv as isobutylene measured in the effluent gas (downstream from CD2). Monitoring requirements are the same as provision 1.
- Blower Extraction Rate shall be ≤ 312 acfm. It should be recorded once initially (the specification and operating performance curves of the soil vapor extraction blower including its maximum throughput shall be kept on-site or at the permittee's main office).
- There shall be no visible emissions, exclusive of condensed water vapor, except for a period of less than three minutes in any consecutive 30 minute period. Opacity will be monitored by a visual determination upon occurrence of event, based on an instantaneous determination.
- Permittee shall post the name of the contact person with address and phone number on a permanent, legible sign in a conspicuous location of the SVE system prior to beginning work (make sure sign is up).
- Permittee shall notify the NJDEP in writing at least 7 days prior to the start-up of the SVE system for the first time.
- Permittee shall notify the NJDEP in writing within 30 days of full completion of the operation of the SVE system and shutting it down permanently.
- The system equipment shall not cause any air contaminant, including an air contaminant detectable by the sense of smell, to be present in outdoor atmosphere in such quantity and duration which is injurious to human health or welfare, animal or plant life or property, or would unreasonably interfere with the enjoyment of life or property. Permittee shall record date and time when operation of permitted equipment caused or has potential to cause off-property effects.
- The potential to emit of total VOCs, speciated HAP and TXS identified by the permittee and any regulated criteria air pollutant shall be below their respective reporting threshold levels.
- Monitoring shall be by grab sampling semi-annually: once every six months; six month cycle shall begin on January 1 and July 1 of each year. Take a TO-15 grab air sample using Summa canisters collected at the stack downstream from CD2 upon startup of the SVE treatment

system, and semi-annually during the first year after startup. The permittee shall calculate maximum hourly emission rate and corresponding yearly emission of any air contaminant identified in the permittee's application using semi-annually analytical laboratory air sampling and testing results. Keep records of certified lab analysis results.

6.0 CONTACTS

Name	Title	Organizational Affiliation	Responsibilities	Phone Number
Nidal Rabah	Project Coordinator	TRC	Manages project – coordinates field team and subcontractors.	973-564-6006 x240
Howard Nichols	Deputy Project Coordinator/Project Engineer	TRC	Manages project – coordinates field team and subcontractors.	973-564-6006 x303 973-610-8529 (cell)
Bhuvnesh J. Parekh	Field Team/QA Manager	TRC	Supervises all field activities	973-564-6006 x336
Samir Bouzrara	Owner of Specialty Systems Integrators	Specialty Systems Integrators (SSI)	SVE System Supplier	763-450-2600
Matt Cordova	Project Manager	Accutest Laboratories, Inc	Laboratory	732-329-0200
Pine Environmental	General Line	Pine Environmental	Equipment Rental	609-371-9663

7.0 HEALTH AND SAFETY PLAN

A site-specific Health and Safety Plan (HASP) has been prepared for this project (Appendix A). This HASP covers minimum safe work practices about excavation, electrical, fire, safety, security, health, environmental and traffic requirements. This HASP will be amended as and when required to accommodate any additional un-safe conditions that are observed at the Site.

8.0 CLOSE-OUT CRITERIA

The treatment system operation and maintenance will be conducted as described above, and is intended to ensure the system is operating correctly, according to manufacturer's specifications and permit requirements.

Based on soil results collected during the RI, and the TCE contaminant iso-concentration map incorporated in the Feasibility Study, TRC has estimated the total adsorbed TCE mass in the treatment zone to range from approximately 60 – 184 lbs. A table summarizing the mass calculations and the Whitman figure used as the basis were provided in the Remedial Design Report (RDR). TRC will use data from the O&M events, including total flow rate and air sample results, to estimate the cumulative mass removed from the system. When the cumulative mass removed approaches the estimated total adsorbed mass, TRC will begin to implement an equilibrium/rebound assessment of the soil gas at the individual SVE wells.

The equilibrium/rebound tests will be conducted by shutting the system off for a period of one to two weeks, and comparing the pre-shut down and rebound, or equilibrium, soil gas concentrations. The vapor phase concentrations will be measured using a calibrated hand-held PID, at sample ports located on the piping to each well, before the control valve. The control valves will be closed to each well at the beginning of the equilibrium testing program. If the test shows that all or some wells experience no increase in VOC concentrations during the rebound period, these wells will be brought off line, until system operation is completed.

A soil gas SVE closure criterion has been developed based on the ROD soil remediation target (AFCEE, 2001). Based on a target soil concentration of 1 mg/kg, and using conversion and equilibrium factors for TCE, a target soil gas concentration (SVE Closure Criterion) ranging between 508 $\mu g/m^3$ and 2,540 $\mu g/m^3$ was calculated. The VOC calculations were presented in the RDR (Table X). This soil gas concentration translates to a range of approximately 0.1 to 0.5 ppm_v. Thus, if wells are observed to have VOC concentrations at or below 0.1 to 0.5 ppm_v during the rebound testing, the wells will be throttled to reduce flow, or the control valves closed to take the wells off line.

The rebound testing program may begin before the target mass has been removed if the removal rate approaches asymptotic levels, where little mass is being removed and the mass removal rate has stalled. The rebound testing will be conducted quarterly to assess the treatment system operation.

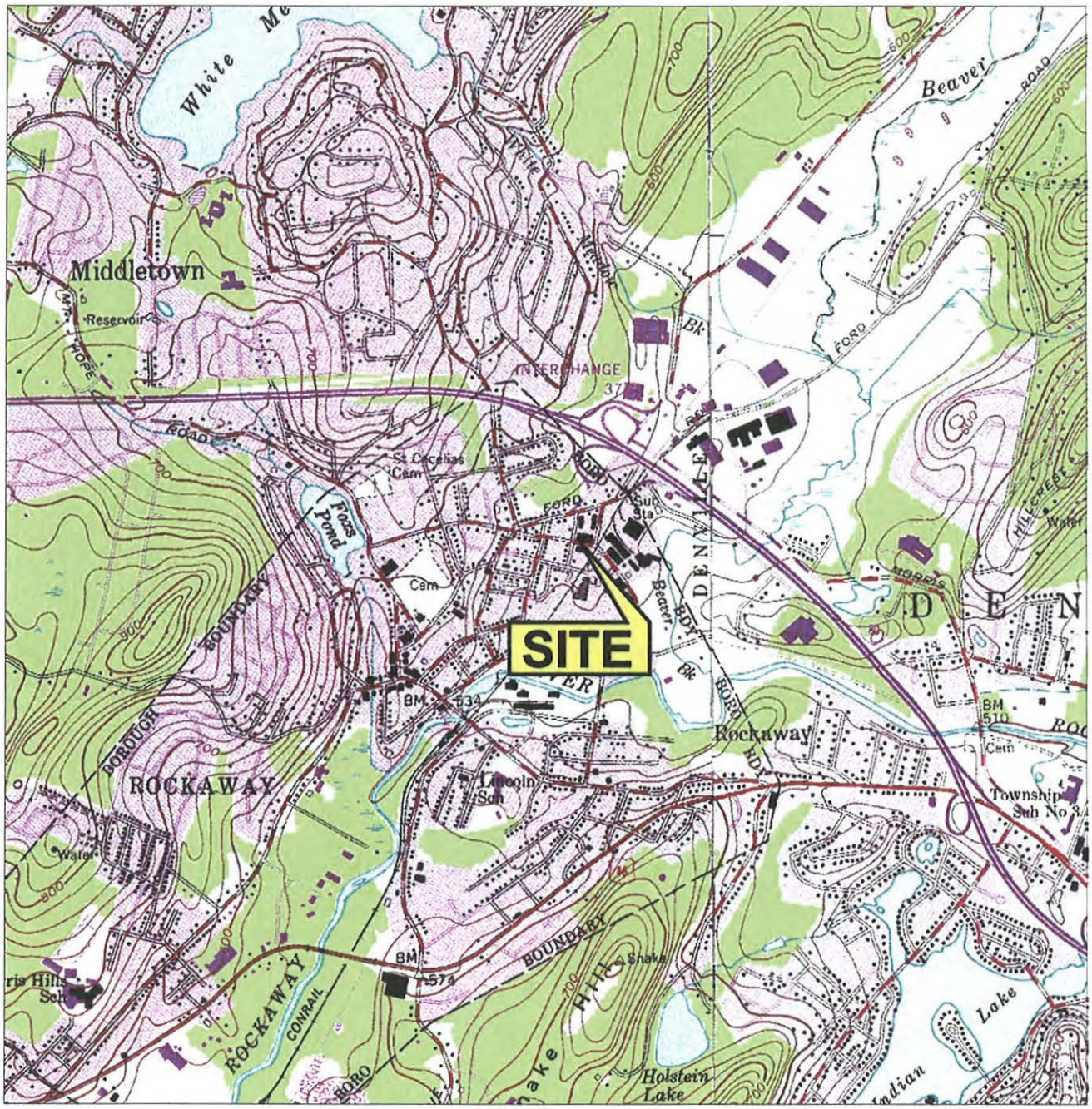
Upon reaching the target VOC concentrations, TRC will collect several confirmatory soil samples to demonstrate the reduction in TCE concentrations in soil. These samples will be collected from the un-saturated soil within the treatment area. The samples will be analyzed for VOCs, and the results presented to EPA and NJDEP to substantiate the decision to shut down all, or portions, of the SVE system. Given the current site operations, and the presence of heavy equipment, the locations of soil samples may be limited. TRC will endeavor to collect samples from each operational zone to demonstrate soil remediation.

Based on the estimated total TCE mass, and the anticipated contaminant removal rate, TRC anticipates achieving the remediation goals within 1-2 years of operation.TRC will report the sampling results and field findings collected from the Site to the NJDEP and EPA in the Monthly Progress Report (MPR).

FIGURES

FIGURE 1

SITE LOCATION MAP



SOURCE: DOVER AND BOONTON, N.J. QUADRANGLES, 1954, PHOTOREVISED 1981
7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)

N

0 2000 FT.

APPROXIMATE SCALE

QUADRANGLE LOCATION

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

SITE LOCATION MAP

KLOCKNER PROPERTY – ROCKAWAY, NJ

JOB NO.: 163292

BJ/LB	DATE: JANUARY 2010	FIGURE: 1

M:\CAD FILES\VISION PROJECTS\163292\163292_SLM.DWG 02/12/2010 08:08:22PM TAB: LAYOUT

FIGURE 2

BUILDING 12 SVE WELL LAYOUT

ELM STREET

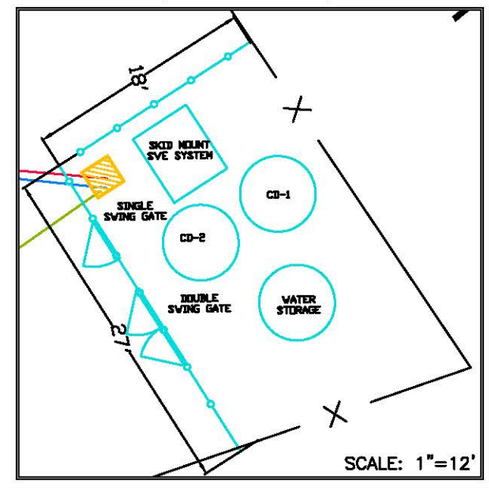
HIBERNIA AVENUE

SEE INSET

VP-15
SVE 2
VP 16
SVE 4
VP 17
SVE 3
VP 20
SVE 7
SVE 6
SVE 5
VP 18
VP 19
VP 21
SVE 8
VP 22
SVE 9
SHED
VP 23
VP 24
SVE 10
VP 13
VP 14
VET-1
VP 9
VP 8
VP 10
VP 11
VP 12
VP 25
QUONSET HUT
CURB
SVE 11
VP 7
VP 1
VP 4
VP 5
VP 6
SVE 1
VP 3
VP 2

4" SCH 40 PVC
4" SCH 40 PVC
4" SCH 40 PVC
6" SCH 40 PVC
4" SCH 40 PVC
6" SCH 80 PVC
4" SCH 80 PVC
4" SCH 80 PVC

INSET
TO BE INSTALLED



LEGEND

- SVE WELL LOCATION
- VAPOR PROBE LOCATION
- EXTRACTION TRENCH
- VET RISER
- HEADER PIPE #1
- HEADER PIPE #2
- HEADER PIPE #3
- HEADER PIPE CONVERGING AREA

0 20 FT.
APPROXIMATE SCALE

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

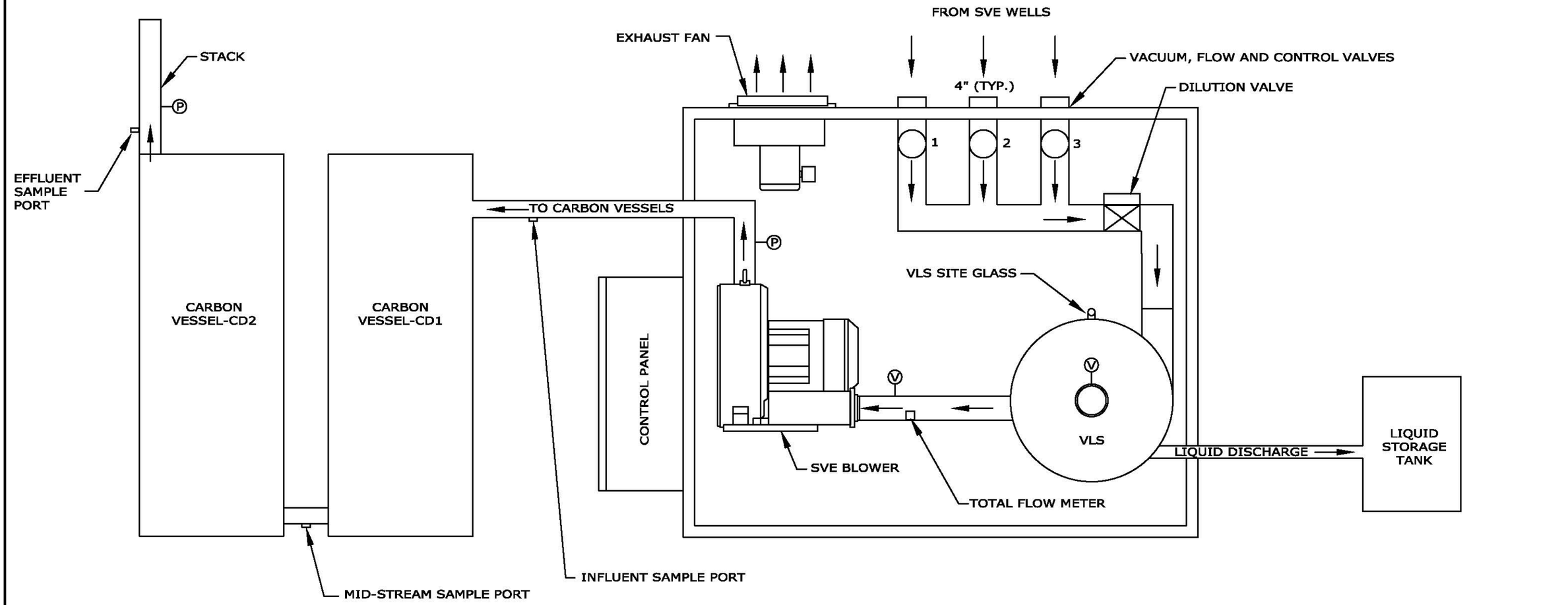
AS-BUILT SVE WELL LAYOUT
BUILDING 12

KLOCKNER PROPERTY – ROCKAWAY, NJ

PREPARED BY: BJP/TM	DATE: MARCH 2013
JOB NO.: 163292	FIGURE: 2

FIGURE 3

SVE SYSTEM LAYOUT



LEGEND

PRESSURE GAUGE —Ⓟ

VACUUM GAUGE —Ⓥ

NOT TO SCALE

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

SVE SYSTEM LAYOUT

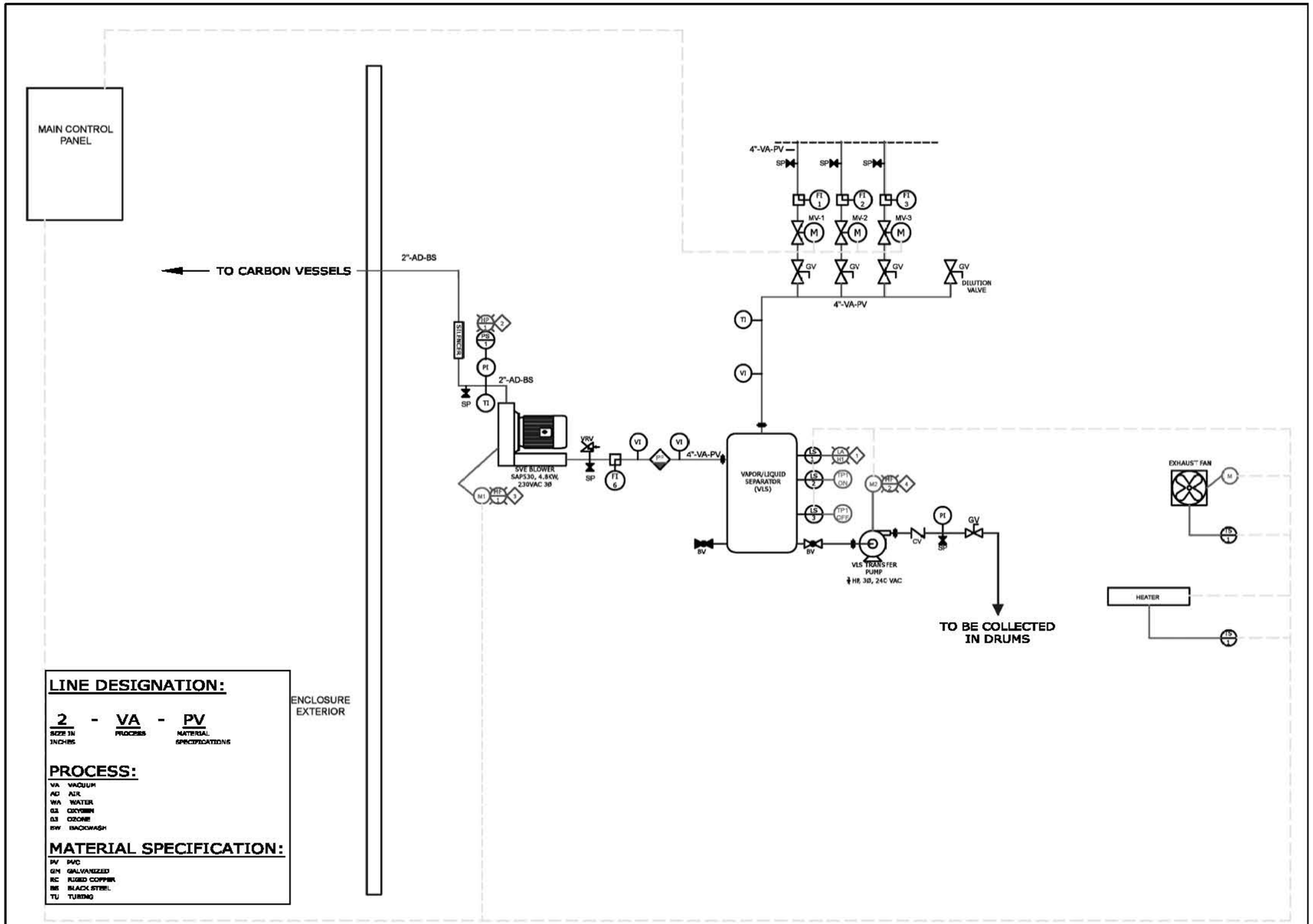
KLOCKNER PROPERTY – ROCKAWAY, NJ

PREPARED BY: AG/TM	DATE: APRIL 2013
JOB NO.: 163292	FIGURE: 3

M:\CAD FILES\VISION PROJECTS\163292\O&M MANUAL\AS-BUILT SVE LAYOUT-2.DWG 04/29/2013 05:18:02PM TAB: SVE SYS

FIGURE 4

PROCESS AND INSTRUMENTATION DIAGRAM (P&ID)



LINE DESIGNATION:

2 - VA - PV

2: SIZE IN INCHES; VA: PROCESS; PV: MATERIAL SPECIFICATIONS

PROCESS:

VA	VACUUM
AC	AIR
WA	WATER
O2	OXYGEN
O3	OZONE
BW	BACKWASH

MATERIAL SPECIFICATION:

PV	PVC
GM	GALVANIZED
RC	RIGID COPPER
BS	BLACK STEEL
TU	TUBING

ENCLOSURE EXTERIOR

NOT TO SCALE

LEGEND

- SOLENOID VALVE
- BUTTERFLY VALVE
- GLOBE VALVE VALVE
- BALL VALVE
- GATE VLAVE
- CHECK VLAVE
- UNION
- SAMPLE VLAVE
- VALVE NORMALLY OPEN
- VALVE NORMALLY CLOSED
- VACUUM RELIEF VALVE
- PRESSURE RELIEF VALVE
- PARTICULATE FILTER
- PRESSURE INDICATOR
- VACUUM INDICATOR
- TEMPERATURE INDICATOR
- SIGHT TUBE
- LEVEL SWITCH No (x)
- TEMPERATURE SWITCH No (x)
- FLOW METER No (x)
- ANALOG TEMPERATURE TRANSMITTER No (x)
- ANALOG FLOW TRANSMITTER No (x)
- ANALOG VACUUM TRANSMITTER No (x)
- RELATIVE HUMIDITY TRANSMITTER No (x)
- HIGH LEVEL ALARM No (x)
- LOW FLOW ALARM No (x)
- LOW VACUUM ALARM No (x)
- HIGH VACUUM ALARM No (x)
- RELATIVE HUMIDITY ALARM No (x)
- MOTOR OVERLOAD No (x)
- FATAL ALARM No (x)
- CONTROL PANEL READOUT
- MOTOR

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

PROCESS & INSTRUMENTATION DIAGRAM

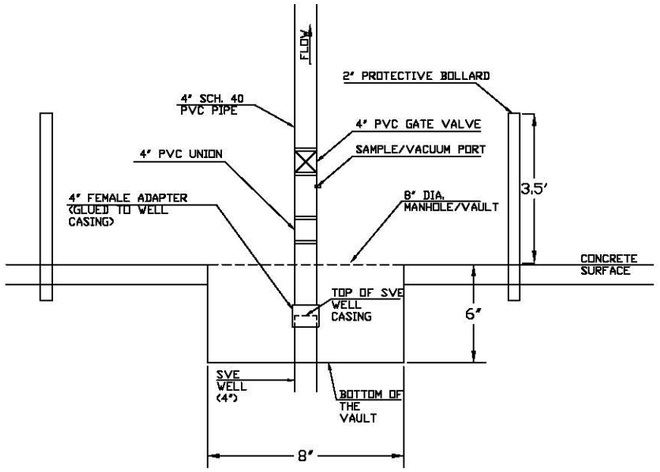
KLOCKNER PROPERTY – ROCKAWAY, NJ

PREPARED BY: AG/TM	DATE: APRIL 2013
JOB NO.: 163292	FIGURE: 4

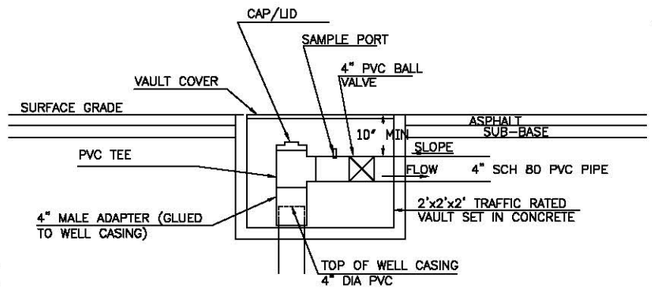
FIGURE 5

AS-BUILT CONSTUCTION DETAILS

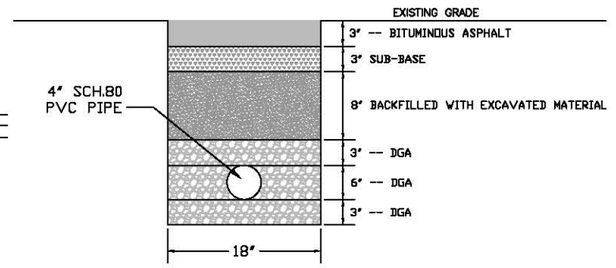
DETAIL 1
INTERIOR SVE WELL COMPLETION
NOT TO SCALE



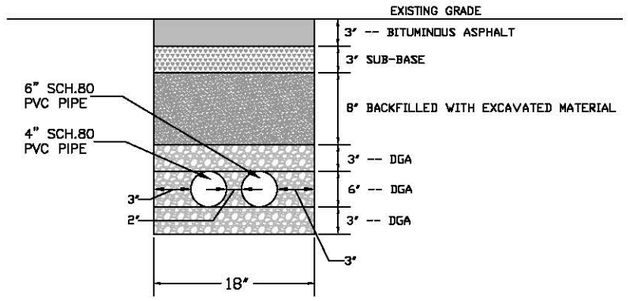
DETAIL 2
EXTERIOR SVE WELL COMPLETION
NOT TO SCALE



DETAIL 3A
CROSS SECTION A–A' OF TRENCH RESTORATION
NOT TO SCALE

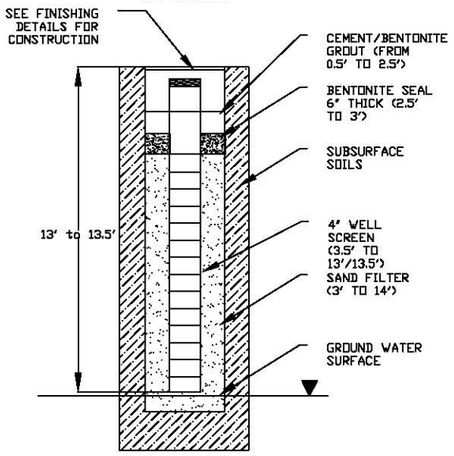


DETAIL 3B
CROSS SECTION B–B' OF TRENCH RESTORATION
NOT TO SCALE

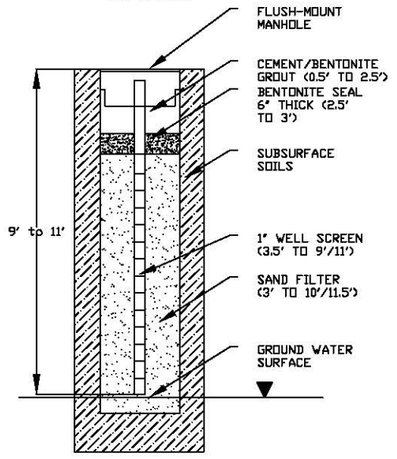


DETAIL 4
SVE WELL AND VP CONSTRUCTION DETAILS

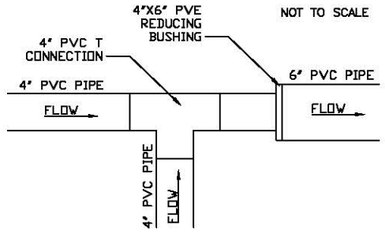
SOIL VAPOR EXTRATION (SVE) WELL
NOT TO SCALE



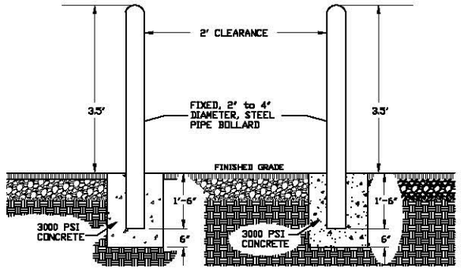
VAPOR PROBE
NOT TO SCALE



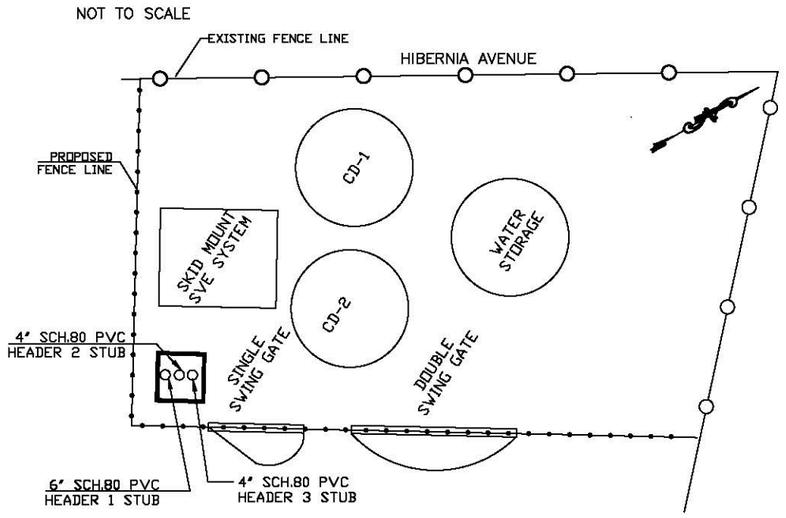
DETAIL 5
PIPE ENLARGEMENT DETAIL
NOT TO SCALE



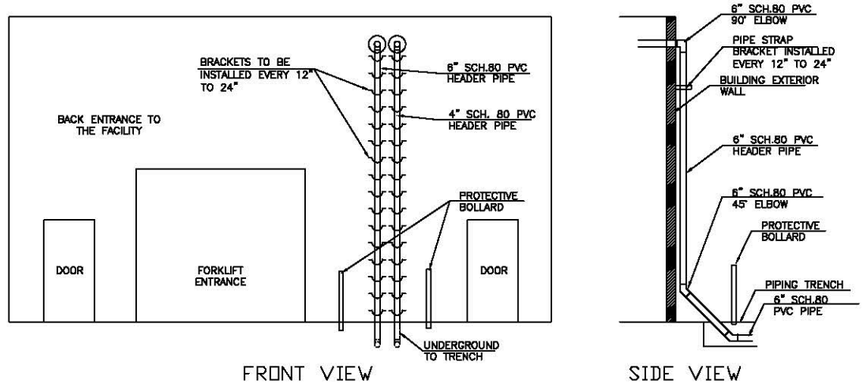
DETAIL 6
CONSTRUCTION DETAIL FOR BOLLARD
NOT TO SCALE



DETAIL 7
PIPE CONVERGANCE DETAIL
NOT TO SCALE



DETAIL 8
SVE HEADER PIPE WALL PENETRATIONS AND TRENCH ENTRANCE
NOT TO SCALE



FRONT VIEW

SIDE VIEW

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

AS–BUILT CONSTRUCTION DETAILS

KLOCKNER PROPERTY – ROCKAWAY, NJ	
PREPARED BY: BJ/SJ	DATE: MARCH 2013
JOB NO.: 163292	FIGURE: 5

TABLES

TABLE 1

SUBCONTRACTOR & VENDOR CONTACTS

Table 1
Subcontractor & Vendor Contacts
Klockner & Klockner
163292

Project Engineer/Deputy PM	TRC Environmental Corporation 57 East Willow Street, Millburn, NJ	Howard Nichols, P.E. 932-564-6006 x303
Field Engineer	TRC Environmental Corporation 57 East Willow Street, Millburn, NJ	Philip Bosco 932-564-6006 x333
Facility Production Manager	Service Metal Fabricators, 10 Stickle Avenue, Rockaway, NJ	Glen Blue 973-625-8882
Laboratory	Accutest Laboratories, Inc. 2235 Route 130, Dayton, NJ	Matt Cordova 732-329-0200
Equipment Rental	Pine Environmental Windsor Industrial Park, 92 North Main Street, Bldg 20, Windsor, NJ 08561	609-371-9663
System Designer	Specialty Systems Integrators 14150 23rd Ave. North Plymouth, MN 55447	Samir Bouzrara 763-450-2600

APPENDICES

APPENDIX A

HEALTH AND SAFETY PLAN

APPENDIX B

NJDEP AIR PERMIT

State of New Jersey
CHRIS CHRISTIE
Governor
KIM GUADAGNO
Lt. Governor
DEPARTMENT of ENVIRONMENTAL PROTECTION
Division of Air Quality
Bureau of Air Permits
401 E. State Street, 2nd floor, P.O. Box 420, Mail Code 401-02
Trenton, NJ 08625-0420
BOB MARTIN
Commissioner

Air Pollution Control
Preconstruction Permit and Certificate to Operate
Construction of a New Source

Permit Activity Number: PCP120001 **Program Interest No: 26792**

Mailing Address	Plant Location
DANIEL KLOCKNER III MGR KLOCKNER & KLOCKNER PO BOX 343 Blairstown, NJ 07825	KLOCKNER & KLOCKNER 10 Stickle Ave Rockaway Boro Morris County, New Jersey

Approval Date: 01/14/2013
Expiration Date: 01/13/2018

The New Jersey Department of Environmental Protection (Department) has reviewed the above referenced air pollution control permit application. On the basis of the information provided, the Department concludes that the application satisfies all applicable requirements of the New Jersey Air Pollution Control regulations codified at N.J.A.C. 7:27 et seq. This permit allows for inspection and evaluation of the equipment by the Department to assure conformance with all provisions of N.J.A.C. 7:27 et seq. and any other applicable federal requirements codified at 40 CFR 52, 60, 61 and 63.

The equipment, that is authorized to be installed and operated under this approval, is described in Section A, Source Operations and Section D, Equipment Inventory. Equipment at the facility referenced by this Permit shall be operated in accordance with the Conditions of Approval set forth in Section D, Facility Specific Requirements.

The Department hereby issues this permit and certificate under the authority of chapter 106, P.L. 1967(N.J.S.A 26:2C-9.2). You may construct, reconstruct, install, or modify the above referenced equipment and/or control apparatus consistent with the approval.

The approved Permit is available for download in PDF format which contains the facility's specific requirements (compliance plan) at: http://www.nj.gov/dep/aqpp. After accessing the web site, click on "Approved PCP Permits" listed under "Reports" and then type in your Program Interest (PI) Number, 26792, as instructed on the screen. You will be able to view, print or electronically store your permit. If you have any questions regarding this permit approval, please contact the Department at the Preconstruction Permit Help Line available from

9:00 AM to 4:00 PM daily, where you may speak to someone about any technical questions you may have. The Preconstruction Permit Technical Help Line number is 609-292-6716.

If, in your judgment as an applicant for an air pollution control permit, the Department is imposing any unreasonable Condition of Approval, you may contest the Department's decision and request a contested case hearing pursuant to the Administrative Code at N.J.A.C. 7:27-1.32(a). All requests for contested case hearings must be received in writing by the Department within twenty (20) calendar days of the date you receive this permit approval and must contain the information specified in the Administrative Hearing Request Checklist and Tracking Form.

If you have any non technical questions please use the Bureau's number 609- 292-0834. If you have any questions when filing a General Permit please use the General Permit Help number 609-633-2829.

Approved by:

William Kuehne
Environmental Engineer 4 (Supervisor)
Preconstruction Permits

Administrative Hearing Request Checklist and Tracking Form

I. Document Being Appealed

Name of the Facility	Facility ID Number	Permit Activity Number	Issuance Date
KLOCKNER & KLOCKNER	26792	PCP120001	

II. Contact Information

Name of Person Requesting Hearing	Name of Attorney (if applicable)
Address:	**Address:**
Telephone:	**Telephone:**

III. Please include the following information as part of your request:

A. The date the permittee received the permit decision;
B. Two printed copies of the document being appealed – for submitting to address 1 below;
A PDF copy of the document being appealed on a CD – for submitting to address 2 below
C. The legal and factual questions you are appealing;
D. A statement as to whether or not you raised each legal and factual issues during the permit application process;
E. Suggested revised or alternative permit conditions;
F. An estimate of the time required for the hearing;
G. A request, if necessary, for a barrier-free hearing location for physically disabled persons;
H. A clear indication of any willingness to negotiate a settlement with the Department prior to the Departments processing of your hearing request to the Office of Administrative Law;

Mail this form, completed, signed and dated with all of the information listed above, including attachment, to:

1. New Jersey Department of Environmental Protection
Office of Legal Affairs
Attention: Adjudicatory Hearing Requests
401 E. State Street, P.O. Box 402
Trenton, New Jersey 08625

2. Air Quality Permitting Element
Preconstruction Permits
New Jersey Department of Environmental Protection
401 E. State Street, 2nd Floor, P.O. Box 027
Trenton, New Jersey 08625
Phone: (609) 633-2829

Signature **Date**

Administrative Hearing Request Checklist and Tracking Form

IV. If you are not the applicant but rather an interested person claiming to be aggrieved by the permit decision, please include the following information:

1. The date you or your agent received notice of the permit decision (include a copy of that permit decision with your hearing request);
2. Evidence that a copy of the request has been delivered to the applicant for the permit which is the subject of the permit decision;
3. A detailed statement of which findings of fact and/or conclusion of law you are challenging;
4. A description of your participation in any public hearings held in connection with the permit application and copies of any written comments you submitted;
5. Whether you claim a statutory or constitutional right to a hearing, and, if you claim such a right, a reference to the applicable statute or explanation of how your property interests are affected by the permit decision;
6. If the appeal request concerns a CAFRA permit decision, evidence that a copy of the request has been delivered to the clerks of the county and the municipality in which the project which is the subject of the permit decision is located;
7. Suggested revised or alternative permit conditions;
8. An estimate of the time required for the hearing;
9. A request, if necessary, for a barrier-free hearing location for physically disable persons;
10. A clear indication of any willingness to negotiate a settlement with the Department prior to the Department's transmittal of the hearing request to the Office of Administrative Law;

Mail this form, completed, signed and dated with all of the information listed above, including attachment, to:

New Jersey Department of Environmental Protection
Office of Legal Affairs
Attention: Adjudicatory Hearing Requests
401 East State Street, P.O. Box 402
Trenton, New Jersey 08625-0402

Air Quality Permitting Element
Preconstruction Permits
New Jersey Department of Environmental Protection
401 E. State Street, 2nd Floor, P.O. Box 027
Trenton, New Jersey 08625
Phone: (609) 633-2829

Signature **Date**

AIR POLLUTION CONTROL PRECONSTRUCTION PERMIT EQUIVALENCY

Table of Contents

Facility Name: KLOCKNER & KLOCKNER
Facility ID No.: 26792
Permit Activity No.: PCP120001

AIR POLLUTION CONTROL PRECONSTRUCTION PERMIT EQUIVALENCY

Section A

Facility Name: KLOCKNER & KLOCKNER
Facility ID No.: 26792
Permit Activity No.: PCP120001

AUTHORIZED SOURCE OPERATIONS

This Preconstruction Permit and the Certificate to Operate for the following equipment is issued pursuant to N.J.A.C. 7:27-8.

Description of Source Activity

Source Operation Type: Soil vapor extraction (SVE) implemented at the Klockner & Klockner Source Area (OU3) of the Rockaway Borough Well Field **SUPERFUND** Site located in Rockaway, Morris County, New Jersey.

Source Operation Description: The SVE system consists of twelve (12) SVE wells and a horizontal trench from which vapor exhausts are treated through two (2) granular activated carbon (GAC) beds before being released into the atmosphere.

Source Operation Details: The sources authorized by this permit shall be operated within the parameters specified in the Equipment, Control Device, and/or Emission Unit/Batch Process Operating Scenario Details of this permit. Operation of the authorized sources within these parameters is required in addition to compliance with the conditions specified in Section D– Facility Specific Requirements.

AIR POLLUTION CONTROL PRECONSTRUCTION PERMIT EQUIVALENCY

Section B

Facility Name: KLOCKNER & KLOCKNER
Facility ID No.: 26792
Permit Activity No.: PCP120001

ACRONYMS

BTS	Bureau of Technical Services
CEMS	Continuous Emissions Monitor System
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COMS	Continuous Opacity Monitor System
EPA	United States Environmental Protection Agency
HAP	Hazardous Air Pollutant
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NOx	Oxides of Nitrogen
PM-2.5	All particulate matter having an aerodynamic diameter less than or equal to a nominal 2.5 microns
PM-10	All particulate matter having an aerodynamic diameter less than or equal to a nominal 10 microns
PST	Performance Specification Test
REO	Regional Enforcement Office - NJDEP
SO_2	Sulfur Dioxide
TSP	Total Suspended Particulate Matter
VOC	Volatile Organic Compounds

AIR POLLUTION CONTROL PRECONSTRUCTION PERMIT EQUIVALENCY

Section C

Facility Name: KLOCKNER & KLOCKNER
Facility ID No.: 26792
Permit Activity No.: PCP120001

GENERAL PROVISIONS AND AUTHORITIES
Preconstruction Permits

1. Not withstanding compliance with other provisions of N.J.A.C. 7:27-1 et seq., no person shall cause, suffer, allow or permit to be emitted into the outdoor atmosphere substances in quantities which shall result in air pollution as defined at N.J.A.C. 7:27-5.1. [N.J.A.C. 7:27-5.2(a)]

2. The permittee shall not construct, reconstruct, install, or modify a significant source or control apparatus serving the significant source without first obtaining a preconstruction permit under N.J.A.C. 7:27-8. [N.J.A.C. 7:27-8.3(a)]

3. The permittee shall not operate (nor cause to be operated) a significant source or control apparatus serving the significant source without a valid operating certificate. [N.J.A.C. 7:27-8.3(b)]

4. Permit Revisions:

   The permittee shall not take any action which requires a permit revision, compliance plan change, seven-day-notice change, amendment, or change to a batch plant permit, under any applicable provision at N.J.A.C. 7:27-8.17 through 8.23, without complying with that applicable provision.

   The following summarize N.J.A.C. 7:27-8.18 through 8.21:

   a. The permittee shall file a permit revision request and receive approval from the Department prior to increasing any maximum allowable emission limit, increasing actual emissions, to a rate or concentration greater than a maximum allowable emission, causing the emissions of a new air contaminant, use a new raw material, reconstructing equipment, change the ground level concentration of an air contaminant in an area where the public has access, replace the permitted source, or constructing or installing a new significant source. [N.J.A.C. 7:27-8.18]

   b. The permittee shall file a compliance plan change request and receive approval from the Department prior to decreasing the frequency of testing, monitoring, recordkeeping, or reporting, changing the monitoring method, changing a level, rate, or limit of an operational parameter included in the conditions, or reducing a source's potential to emit. [N.J.A.C. 7:27-8.19]

   c. At least seven days prior to proceeding with a physical or operational change that is outside the scope of activities allowed by this permit, but will not increase emissions over the allowable emissions and will not alter the stack characteristics, the permittee shall file a seven-day-notice change. The permittee may proceed with the proposed changes seven days after such notice is filed with the Department. [N.J.A.C. 7:27-8.20]

d. The permittee shall file an amendment within 120 days of making any change of the information contained within Section C of this permit (Facility Profile), changing the name, number or designation of any equipment or stack covered by this permit, changing the parameters of a stack in such a way to reduce the ground level concentration of an air contaminant, or correction of a typographical error that will not result in an increase of actual or allowable emissions. [N.J.A.C. 7:27-8.21]

The permittee shall review the provisions of N.J.A.C. 7:27-8.18 through 7:27-8.21 to determine the appropriate type of request to file.

5. The permittee shall make the preconstruction permit or certificate, together with any amendments, seven-day-notices, or other documents related to the permit and certificate, readily available for Department inspection on the operating premises. [N.J.A.C. 7:27-8.3(d)]

6. The permittee shall not use or cause to be used the equipment or control apparatus unless all components connected or attached to, or serving, the equipment or control apparatus, are functioning properly and are in compliance with the preconstruction permit and certificate and all conditions and provisions thereto. [N.J.A.C. 7:27-8.3(e)]

7. A preconstruction permit is not transferable either from the location authorized in the preconstruction permit to another location, or from any one piece of control apparatus or equipment to another piece of control apparatus or equipment. [N.J.A.C. 7:27-8.3(f)]

8. Once a permit or certificate is issued, the permittee is fully responsible for compliance with N.J.A.C. 8:27-8 and with the permit and certificate, including adequate design, construction, and operation of the source, even if employees, contractors, or others work on or operate the permitted source. If the Department issues any other requirement with the force of law, such as an order, which applies to the source, the permittee is also responsible for compliance with that requirement. [N.J.A.C. 7:27-8.3(g)]

9. Preconstruction permits and certificates do not any way relieve the permittee from the obligation to obtain necessary permits from other government agencies and to comply with all other applicable Federal, State, and local rules and regulations. [N.J.A.C. 7:27-8.3(h)]

10. The permittee shall not suffer, allow, or permit any air contaminant detectable by the sense of smell, to be present in the outdoor atmosphere in such quantity and duration which is, or tends to be, injurious to human health or welfare, animal or plant life or property, or would unreasonably interfere with the enjoyment of life or property. This shall not include an air contaminant which occurs only in areas over which the permittee has exclusive use or occupancy. In determining whether an odor unreasonably interferes with the enjoyment of life or property, the Department shall consider all of the relevant facts and circumstances, including, but not limited to, the character, severity, frequency, and duration of the odor, and the number of persons affected thereby. In considering these and other relevant facts and circumstances, no one factor shall be dispositive, but each shall be considered relevant in determining whether an odor interferes with the enjoyment of life or property, and, if so, whether such interference is unreasonable considering all of the circumstances. [N.J.A.C.7:27-8.3(j)]

11. The Department and its representatives have the right to enter and inspect any facility or property in accordance with N.J.A.C. 7:27-1.31. [N.J.A.C. 7:27-8.3(m)]

12. There shall be an affirmative defense to liability for penalties for a violation of a preconstruction permit or certificate occurring as a result of an equipment malfunction, an equipment start-up, an equipment shutdown, or during the performance of necessary maintenance. The affirmative defense shall be asserted and established as required pursuant to P.L. 1993. c.89 (adding N.J.S.A. 26:2C-19.1 through 2C-19.5) and any rules the Department promulgates thereunder, and shall meet all of the requirements thereof. There shall also be an affirmative defense to liabilities for penalties or other sanctions for noncompliance with any technology based emission limitation in this permit or certificate, if the noncompliance was due to an emergency as defined at N.J.A.C. 7:27-22.1, provided that the affirmative defense is asserted and established in compliance with 40 CFR 70.6(g) and meets all requirements thereof. [N.J.A.C. 7:27-8.3(n)]

13. The permittee shall not cause or use the equipment specified in a preconstruction permit in a manner that will result in the emission of any air contaminant not listed in the Facility Specific Requirements in this Preconstruction Permit at a rate equal to or higher than the applicable reporting threshold set forth at N.J.A.C. 7:27-8 Appendix I, Table A or B. [N.J.A.C. 7:27-8.4(k)1]

14. No air contaminant, or category of air contaminant, where accepted by the Department, shall be emitted other than those approved in the preconstruction permit. [N.J.A.C. 7:27-8.13(a)]

15. Any person to whom the Department has issued a preconstruction permit or certificate shall comply with all terms and conditions of any order related to the preconstruction permit or certificate. [N.J.A.C. 7:27-8.13(a)]

16. The permittee shall maintain all records required in the preconstruction permit for a period of five (5) calendar years from the calendar year within which the record was generated. [N.J.A.C. 7:27-8.13(a)]

17. The Department may change the conditions of approval of any approved certificate to operate at the time of renewal of a temporary operating certificate; at the time of approval or renewal of a five-year operating certificate; or at any time during the period a certificate is in effect, if the Department determines that such change is necessary to protect human health or welfare or the environment. [N.J.A.C. 7:27-8.13(b)]

18. Upon request of the Department, the permittee shall submit to the Department information relevant to the operation of equipment and control apparatus including all information specified at N.J.A.C. 7:27-8.13(c). [N.J.A.C. 7:27-8.13(c)]

19. If the conditions of a preconstruction permit or certificate to operate require the Department to incur any of the following charges, the permittee shall reimburse the Department for the full amount of these charges: (1) The charges billed by any phone company for the maintenance of a dedicated telephone line required by this permit or the certificate to operate for the electronic transmission of data; or (2) The charges billed by any laboratory for performing the analysis of audit samples collected pursuant to testing or monitoring required by this permit or the certificate to operate. [N.J.A.C. 7:27-8.13(g)]

20. Any exceedance of the operating requirements or emission concentrations specified in a preconstruction permit shall be reported within three (3) business days, by writing to the Regional Enforcement Office. [N.J.A.C. 7:27-8.13(h)]

21. The permittee shall, when requested by the Department, provide such testing facilities exclusive of instrumentation and sensing devices as may be necessary for the Department to determine the kind and amount of air contaminants emitted from the equipment or control apparatus. The testing facilities shall include the utilities, the structure to hold testing equipment and/or personnel, and any ports in stacks needed to carry out testing required by this permit. During testing by the Department, the equipment and control apparatus shall be operated under such conditions within their capacities as may be requested by the Department. The test facilities may be either permanent or temporary, at the discretion of the person responsible for their provision, and shall conform to all applicable laws, regulations, and rules concerning safe construction and safe practice. Testing facilities, which contain platforms and other means of personnel access, shall conform to OSHA standards. [N.J.A.C. 7:27-8.13(i)]

22. Upon request of the Department, the permittee shall submit to the Department any record relevant to any permit or certificate. Such records shall be submitted to the Department within thirty (30) days of the request by the Department or within a longer time period if approved in writing by the Department. [N.J.A.C. 7:27-8.15(a)]

23. The permittee shall submit any required report in a format and on a schedule approved by the Department. Such report shall be transmitted on paper, on computer disk, or electronically, at the discretion of the Department. [N.J.A.C. 7:27-8.15(b)]

24. Any report submitted to the Department, including but not limited to, a report submitted as an amendment of this permit or the certificate to operate pursuant to N.J.A.C. 7:27-8.3(c) shall include, as an integral part of the report, certifications complying with N.J.A.C. 7:27-1.39. [N.J.A.C. 7:27-8.15(c)]

25. Upon request of the Department, the permittee shall report on forms obtained from the Department the air contaminant actual emissions and information relevant thereto, of any air contaminant or category of air contaminant emitted by the equipment, control apparatus, or source operation. [N.J.A.C. 7:27-8.15(d)]

26. Any emission limit values in a preconstruction permit shall be interpreted to be followed by inherent trailing zeros (0) in the decimal portion of the limit to three significant figures (e.g. a printed limit of “1 lb/hr” means a limit of “1.00 lb/hr”).

27. This listing of requirements reflects the state rules and regulations that apply to a majority of sources. If a specific requirement in a rule or regulation that applies to a permittee is not included in this section or in the Facility Specific Requirements it does not relieve the permittee from the obligation to comply with that regulation.

28. Process monitors must be operated at all times when the associated process equipment is operating except during outage time allowed by Department guidelines/procedures or as outlined in Technical Manual 1005. The Permittee must keep a service log as required.

29. The following Department offices may be referenced in a preconstruction permit. Please use the following addresses when submitting any correspondence to these offices:

Bureau of Technical Services
P. O. Box 437
380 Scotch Road
West Trenton, NJ 08625

Central Regional Enforcement Office
P. O. Box 407
Trenton, NJ 08625-0407

Northern Regional Enforcement Office
7 Ridgedale Avenue
Cedar Knolls, NJ 07927

Southern Regional Enforcement Office
2 Riverside Drive – Suite 201
Camden, NJ 08102

30. In accordance with the Air Pollution Control Act at N.J.S.A. 26:2C-19(e), any operation of the equipment which may cause off-property effect, including odors, shall be immediately reported by calling the NJDEP Environmental Action Hotline at (877) 927-6337.

31. In accordance with N.J.A.C. 7:27-21, facilities are required to submit annual emission statements of their actual emissions if the Potential-to-emit for the entire facility exceeds the following thresholds (including all emissions from the facility, both permitted and unpermitted). Additional information about Emission Statement reports can be obtained by calling (609) 984-5483.

AIR CONTAMINANT	**Threshold in Tons per Year**
VOC (Volatile Organic Compounds	10
NOx (Oxides of Nitrogen)	25
CO (Carbon Monoxide)	100
SO_2 (Sulfur Dioxide)	100
TSP (Total Suspended Particulates)	100
$PM_{2.5}$ (Particulate Matter $\leq$ 2.5 microns)	100
PM_{10} (Particulate Matter $\leq$ 10 microns)	100
NH_3 (Ammonia)	100
Lead	5

32. In accordance with N.J.A.C. 7:27-22, facilities are required to submit a Title V Operating Permit application, within one year, if the potential-to-emit for the entire facility exceeds any of the following thresholds (including all emissions from the facility, both permitted and unpermitted). Additional Information about Operating Permits can be obtained by calling the Operating Permit Hotline at (609) 633-8248.

AIR CONTAMINANT	**Threshold in Tons per Year**
VOC (Volatile Organic Compounds)	25
NOx (Oxides of Nitrogen)	25
CO (Carbon Monoxide)	100
SO_2 (Sulfur Dioxide)	100
TSP (Total Suspended Particulates)	100
PM_{10} (Particulate Matter $\leq$ 10 microns)	100
Lead	10
Any HAP (Hazardous Air Pollutant)	10
All HAPs Collectively	25
Any other Air Contaminant	100

AIR POLLUTION CONTROL PRECONSTRUCTION PERMIT EQUIVALENCY

Section D

Facility Name: KLOCKNER & KLOCKNER
Facility ID No.: 26792
Permit Activity No.: PCP120001

PERMIT INFORMATION

FACILITY SPECIFIC REQUIREMENTS INDEX

FACILITY SPECIFIC REQUIREMENTS

REASON FOR APPLICATION

FACILITY PROFILE (GENERAL)

EQUIPMENT INVENTORY

CONTROL DEVICE INVENTORY

EMISSION POINT INVENTORY

EMISSION UNIT/BATCH PROCESS INVENTORY

AIR POLLUTION CONTROL PRECONSTRUCTION PERMIT EQUIVALENCY

Section D

Facility Name: KLOCKNER & KLOCKNER
Facility ID No.: 26792
Permit Activity No.: PCP120001

FACILITY SPECIFIC REQUIREMENTS INDEX

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 SVE Full Scale System**
CD1 GAC-1, CD2 GAC-2

Subject Item:

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Consists of at least two (2) 1000 pounds of vapor phase granular activated carbon (GAC) per column installed in series. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially : Carbon column manufacturer/vendor specifications. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. All documentation records shall be kept on-site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8]	None.
2	Total GAC removal efficiency of VOC (Total) >= 99 %. [N.J.A.C. 7:27- 8]	VOC (Total): Monitored by documentation of construction once initially : GAC column manufacturer 's VOC (total) emissions performance guarantee data. [N.J.A.C. 7:27- 8]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. All documentation of construction shall be kept on-site or at the permittee's main offices, for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8]	None.
3	VOC (Total) <= 50 ppmv as Isobutylene. At all times while operating, breakthrough shall be defined as this specified concentration measured between the two (2) GAC units. [N.J.A.C. 7:27- 8.13(h)1]	VOC (Total): Monitored by periodic emission monitoring at the approved frequency, based on 3 minute intervals using a PID/FID or equal monitoring device as follow: Daily during the 1st week of the SVE system install- then weekly within first month of operation and monthly thereafter. [N.J.A.C. 7:27- 8.13(d)1]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency :Daily during the 1st week of the SVE system install- then weekly within first month of operation and monthly thereafter. All monitoring results shall include the following: 1. Date of meter reading, 2. GAC column designation, 3. Effluent gas throughput {scfm}, 4. VOC meter reading {ppmv as isobutylene} and 5. Corresponding VOC (total) mass emission rate {lb/hour} prior to or at breakthrough. All monitoring records shall be kept on-site or at the permittee's main office for a minimum of 5 years and made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8.13(d)3]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	Prior to or at breakthrough, the facility shall replace the spent GAC with a "new" or "regenerated" unit. [N.J.A.C. 7:27- 8]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The permittee shall record the following: 1. The date, time and designation of replaced and "new"or "regenerated" carbon column, 2. VOC (total) concentration {ppmv as isobutylene} and 3. VOC (total) mass emission rate {lb/hr}, prior to or at breakthrough, in a bound logbook or in computer memories. All records shall be kept on-site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8]	None.
5	VOC (Total) <= 20 ppmv as isobutylene measured in the effluent gas (downstream from CD2). [N.J.A.C. 7:27- 8.13(h)1]	VOC (Total): Monitored by periodic emission monitoring at the approved frequency, based on 3 minute intervals using a PID/FID or equal monitoring device as follow: Daily during the 1st week of the SVE system install- then weekly within first month of operation and monthly thereafter. The Department reserves the right to change the frequency of periodic emission monitoring based on a review of the VOC (total) periodic emission monitoring data results. [N.J.A.C. 7:27- 8.13(d)1]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each week during operation. All monitoring results shall include the following: 1. Date of meter reading; 2. GAC designation; 3. Effluent gas throughput {scfm}; 4. VOC meter reading {ppmv as isobutylene} and 5. VOC (total) mass emission rate {lb/hour}. All monitoring records shall be kept on-site or at the permittee's main office for a minimum of 5 years and made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8.13(d)3]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
6	At breakthrough, the facility shall replace CD1 with CD2 or a "new"/freshly regenerated carbon column. In addition, a "new"/freshly regenerated carbon column shall replace CD2 at the latest one (1) operating week from the date of initial breakthrough. Saturated or partially used adsorption material shall be disposed of in a manner that minimizes releases of air contaminants to the atmosphere. This shall be done in accordance with all applicable State and Federal Solid Waste Management Regulations. [N.J.A.C. 7:27- 8]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The permittee shall record the following: 1. Date, time and designation of "new" and replaced carbon columns, 2. VOC (total) breakthrough concentration and 3. Equivalent exhaust VOC (total) pounds per hour at breakthrough, in a bound logbook or in computer memories. All records shall be kept on-site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 SVE Full Scale System**
E1 SVE Blower

Subject Item:

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	The SVE blower shall be operating fully on electrical power from the grid. [N.J.A.C. 7:27- 8]	Monitored by visual determination upon occurrence of event. [N.J.A.C. 7:27- 8]	None.	None.
2	The soil vapor extraction header pipe shall be sealed and directed through the soil vapor extraction blower E1 to the two (2) granular activated carbon columns CD1 and CD2 installed in series. [N.J.A.C. 7:27- 8]	Monitored by visual determination upon occurrence of event. [N.J.A.C. 7:27- 8]	None.	None.
3	Blower Extraction Rate <= 312 Cubic feet per minute. The maximum extraction rate of the blower shall be restricted using the full capacity of the blower at maximum design load or RPM and pressure drop, respectively. [N.J.A.C. 7:27- 8.13(d)2ii]	Blower Extraction Rate: Monitored by flue gas flow rate instrument continuously or equipment settings per equipment manufacturer O&M manual specifying blower maximum extraction rate at maximum full design load or RPM and pressure drop, respectively, and ambient air operating conditions. The Permittee shall install, calibrate and maintain the monitors in accordance with the manufacturer?s specifications. [N.J.A.C. 7:27- 8]	Blower Extraction Rate: Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. The specification and operating performance curves of the soil vapor extraction blower including its maximum throughput shall be kept on-site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8.13(d)3]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 SVE Full Scale System**

Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	The soil vapor extraction (SVE) is implemented at the Klockner & Klockner Source Area (OU3) of the Rockaway Borough Well Field Superfund Site located in Rockaway, N.J. The full scale SVE system incorporates 12 SVE wells and one (1) horizontal trench VET-1. [N.J.A.C. 7:27- 8]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
2	Opacity: There shall be no visible emissions from any of the twelve (12) SVE wells, the horizontal trench, SVE blower (E1) and the stack (PT1) exclusive of condensed water vapor, except for a period of not longer than three (3) minutes in any consecutive thirty (30) minute period. No visible emissions are equivalent to less than five percent (5%) opacity as determined using New Jersey Air Test Method 2 [N.J.A.C. 7:27-6.2(d)] and [N.J.A.C. 7:27- 6.2(e)]	Opacity: Monitored by visual determination upon occurrence of event, based on an instantaneous determination. For compliance with the opacity standard, the permittee, upon request of the Department or when emissions are observed above the allowable limits, shall conduct visual opacity inspections during daylight hours. Visual inspections shall consist of a visual survey to identify if the soil vapor extraction from any of the twelve (12) SVE, horizontal trench, SVE blower (E1) and the stack (PT1) produces visible emissions, (other than condensed water vapor), greater than the prescribed standard. If visible emissions are observed, the permittee shall do the following: (1) Verify that soil vapor extraction from the well and/or the horizontal trench that is causing visible emission is performed in accordance with the permit compliance plan and all applicable conditions of this approval. If not, the permittee shall take corrective action immediately to eliminate excess visible emissions. The permitee must report any permit violations to the Department. (2) If the corrective action taken in Step (1) does not correct the opacity problem within 24 hours, the permittee shall perform a check via a certified opacity reader, in accordance with New Jersey Air Test Method 2. Such test shall be conducted each day until corrective action successfully corrects the opacity problem. [N.J.A.C. 7:27- 8.13(d)]	Opacity: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The permittee shall record the following: (1) Date and time of opacity inspection; (2) Location(s) of visible emission points; (3) Soil vapor extraction status inside the cluster well(s); (4) Observed results and conclusions; (5) Description of corrective action taken, if needed; (6) Date and time opacity problem was solved, if applicable; (7) New Jersey Test Method 2 results, if conducted; and (8) Name of person(s) conducting the inspection. All records shall be kept on-site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8.13(d)]	Submit a report: Upon occurrence of event over the allowable amount: The Permittee shall immediately take corrective measures to prevent visible emissions. If these measures fail, within 24-hours of observation, the permittee shall report the incident time and date of occurrence, source or location of visible emissions and control measures taken in writing to the NJDEP Northern Regional Enforcement Office within three (3) working days from occurrence. [N.J.A.C. 7:27- 8.13(d)4]
3	The permittee shall post the name of the contact person, together with the address and phone number, on a permanent, legible sign in a conspicuous location of the SVE system prior to beginning the work to be performed in accordance with this permit approval. [N.J.A.C. 7:27- 8]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	The permittee shall notify the NJDEP Northern Regional Enforcement Office in writing at least seven (7) days prior to the start-up of the SVE system for the first time. [N.J.A.C. 7:27- 8]	None.	None.	Submit a report: As per the approved schedule : Seven (7) days prior to the start-up of the SVE system, to the NJDEP, Northern Regional Enforcement Office. [N.J.A.C. 7:27- 8]
5	The permittee shall notify the Northern Regional Enforcement Office in writing within thirty (30) days of the full completion of the operation of the SVE system and shutting it down permanently. [N.J.A.C. 7:27- 8.13(d)4]	None.	None.	Submit a report: Once initially, or upon closure to the NJDEP, Northern Regional Enforcement Office. [N.J.A.C. 7:27- 8.13(d)4]
6	The equipment specified in this permit shall not cause any air contaminant, including an air contaminant detectable by the sense of smell, to be present in outdoor atmosphere in such quantity and duration which is, or tends to be, injurious to human health or welfare, animal or plant life or property, or would unreasonably interfere with the enjoyment of life or property. This shall not include an air contaminant which occurs only in areas over which the owner or operator has exclusive use or occupancy. [N.J.A.C. 7:27- 8]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The permittee shall record date and time when the operation of permitted equipment caused or has the potential to cause off-property effects. "Potential to cause" means an instance when the equipment begins to emit an odor, fugitive dust or other contaminant which may result in off-property complaints. All records shall be kept on-site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8]	Submit notification: Upon occurrence of event : The permittee shall report any operation of the equipment which may cause a release of air contaminants in a quantity which poses a potential threat to public health, welfare, or the environment or which might reasonably result in citizen complaints. The permittee shall immediately notify the Department of any non-compliance by calling the New Jersey Environmental Protection Action Hotline at (877) 927-6337. [N.J.A.C. 7:27- 8]
7	No person shall use or cause to be used any equipment or control apparatus unless all components are connected or attached to, or serving the equipment or control apparatus, are functioning properly and are in use in accordance with the preconstruction permit and certificate and all conditions and provisions hereto. [N.J.A.C. 7:27- 8]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	The potential to emit of VOC (total), speciated HAP and TXS identified by the permittee and any regulated criteria air pollutant shall be below their respective reporting threshold or deminimis levels as specified in N.J.A.C. 7:27-8 Appendix 1, Table A and B, or 0.05 lb/hr, whichever is applicable. [N.J.A.C. 7:27- 8.13(h)]	Monitored by grab sampling semiannually: once every six months; six month cycle shall begin on January 1 and July 1 of each year, based on the averaging period as per Department approved test method using state and federally approved analytical laboratory air sampling and testing methodologies as follow: A TO-15 grab air sample using summa canister will be collected at the stack downstream from CD2 upon startup of the SVE treatment system, and semi-annually during the first year after startup. The permittee shall calculate maximum hourly emission rate and corresponding yearly emission of any air contaminant identified in the permittee's application using semi-annually analytical laboratory air sampling and testing results. After the first year, the permittee may petition the Department to reduce the frequency of analytical laboratory sampling and testing at the stack. The Department reserves the right to change the frequency of analytical laboratory sampling & testing of effluent gas based on a review of the VOC (total) and speciated HAPs/TXS analytical laboratory testing results. [N.J.A.C. 7:27- 8]	Recordkeeping by certified lab analysis results semiannually: once every six months; six month cycle shall begin on January 1 and July 1 of each year. All analytical laboratory air sampling and testing results including emissions calculations shall be kept on site or at the permittee's main office for at least five (5) years, readily made available to the Department or its representatives upon request. [N.J.A.C. 7:27- 8]	None.

KLOCKNER & KLOCKNER (26792)
PCP120001

Date: 1/14/2013

New Jersey Department of Environmental Protection
Reason for Application

Permit Being Modified

Permit Class: **Number:** 0

Description of Modifications: The proposed SVE system will be installed to address soil contaimation at this Superfund Site. The design is based on a pilot test conducted in November 2010, under permit activity number: EIP10002

KLOCKNER & KLOCKNER (26792)
PCP120001

New Jersey Department of Environmental Protection
Facility Profile (General)

Facility Name (AIMS): Klockner & Klockner

Facility ID (AIMS): 26792

Street Address: 10 STICKEL AVE
ROCKAWAY, NJ 07866

Mailing Address: RIKER DANZING SHERER HYLAND PERRETI
C/O MICHELE GLASS
HEADQUARTERS PLZ ONE SPEEDWELL AVE
MORRISTOWN, NJ 07962

State Plane Coordinates:

X-Coordinate:	490,594
Y-Coordinate:	755,270
Units:	New Jersey State Plane ٤
Datum:	
Source Org.:	
Source Type:	

County: Morris

Location Description: The site is located in Rockaway Borough. It is an industrial site.

Industry:

Primary SIC:	
Secondary SIC:	
NAICS:	531120

KLOCKNER & KLOCKNER (26792)
PCP120001

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: BAQE - Engineering

Organization: N.J. Department of Environmental Protection
Org. Type: State
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NJ EIN:
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Organization: TRC Environmental Corporation
Org. Type: Corporation
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Contact Type: EPA Official

Organization: US EPA
Org. Type: Federal
Name: Brian Quinn
NJ EIN:
Title: Project Manager
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NJ Remediation Branch
290 Broadway 19th Floor
New York, NY 10007

KLOCKNER & KLOCKNER (26792)
PCP120001

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: On-Site Manager

Organization: TRC Environmental Corporation
Org. Type: Corporation
Name: Howard Nichols III
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Contact Type: Responsible Official

Organization: Klockner and Klockner
Org. Type: LLC
Name: Daniel Klockner III
NJ EIN:
Title: President
Phone: (908) 362-6062 x
Fax: ( ) - x
Other: ( ) - x
Type:
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Blairstown, NJ 07825

Contact Type: Responsible Party

Organization: Klockner and Klockner
Org. Type: LLC
Name: Daniel Klockner III
NJ EIN:
Title: President
Phone: (908) 362-6062 x
Fax: ( ) - x
Other: ( ) - x
Type:
Email:
Mailing Address: PO Box 343
Blairstown, NJ 07825

KLOCKNER & KLOCKNER (26792) Date: 1/14/2013

PCP120001

New Jersey Department of Environmental Protection
Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand-Fathered	Last Mod. (Since 1968)	Equip. Set ID
E1	SVE Blower	SVE Blower	Soil Venting Equipment		12/3/2012	No	12/3/2012	

KLOCKNER & KLOCKNER (26792) Date: 1/14/2013

PCP120001

New Jersey Department of Environmental Protection
Control Device Inventory

CD NJID	Facility's Designation	Description	CD Type	Install Date	Grand-Fathered	Last Mod. (Since 1968)	CD Set ID
CD1	GAC-1	GAC-1	Adsorber	1/20/2013	No	1/20/2013	
CD2	GAC-2	GAC-2	Adsorber	12/3/2012	No	1/20/2013	

KLOCKNER & KLOCKNER (26792)
PCP120001

Date: 1/14/2013

New Jersey Department of Environmental Protection
Emission Points Inventory

PT NJID	Facility's Designation	Description	Config.	Equiv. Diam. (in.)	Height (ft.)	Dist. to Prop. Line (ft)	Exhaust Temp. (deg. F)			Exhaust Vol. (acfm)			Discharge Direction	PT Set ID
							Avg.	Min.	Max.	Avg.	Min.	Max.		
PT1	EP-1	Exhaust stack after GAC adsorbers	Round	2	16	15	100.0	50.0	180.0	400.0	300.0	460.0	Up	

KLOCKNER & KLOCKNER (26792)
PCP120001

Date: 1/14/2013

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 1 SVE-Full1 SVE Full Scale System

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours		VOC Range	Flow (acfm)		Temp. (deg F)	
								Min.	Max.		Min.	Max.	Min.	Max.
OS1	SVE	SVE Full Scale System	Normal - Steady State	E1	CD1 (P) CD2 (S)	PT1		8,000.0	8,760.0	C	300.0	460.0	50.0	180.0

APPENDIX C

OPERATION LOG SHEETS

Table 1
Pre-Start Up Checklist and Start-Up Procedures
Klockner & Klockner
163292

Pre-Start Up Checklist

	Inspection Item	*Completed? Y/N*	*Comments*
1	Verify that power is disconnected at main disconnect.		
2	Verify that all valves to all SVE wells are in the fully open position.		
3	Verify that all vapor points are capped.		
4	Verify that dilution valve is in the fully open position.		
5	Verify that both HOA switches are in the OFF position.		
6	Verify that the valve to Header line #1 is fully open and valves to Header lines #2 & #3 are fully closed.		
7	Test vacuum relief valve to ensure correct functionality.		
8	Verify that drain port on VLS tank is in the closed position.		
9	Inspect electrical components for frayed wiring, corrosion, etc.		
10	Inspect all above ground piping for visible cracks, corrosion, etc.		

Comments

Start Up Procedures

1	Move lever on main electrical disconnect to ON position.
2	Turn HOA switch for VLS pump to Auto position.
3	Turn HOA switch for blower to Auto position.
4	Allow system to run with only one Header line open for about 1 hour while monitoring system. Record start time below.
5	Use portable smoke machine to place smoke around well vaults or piping to check for vacuum leaks in operating zone.
6	Monitor discharge temperature and pressure gauges to ensure acceptable levels. Note any issues or questionable items in the comments section below. If discharge pressure exceeds acceptable limits, shut down system and notify TRC immediately.
7	Once system has stabilized and run for about 1 hour, slowly open valve to Header line #2, then slowly close valve to Header line #1 and repeat steps 4 - 6. Record Start/Stop times below.
8	Once system has stabilized and run for about 1 hour, slowly open valve to Header line #3, then slowly close valve to Header line #2 and repeat steps 4 - 6. Record Start/Stop times below.
9	Once system has stabilized and run for about 1 hour, slowly open valves to Header lines #1 & #2 so that all Header lines are open. Record Start/Stop times below.
10	Monitor system for 1 hour, note any issues in comments section below.
11	After monitoring for about 1 hour, close valves to Header lines #2 & #3 so that only one header line is running at a time.

	Start Time	Stop Time
Header Line #1 Operating		
Header Line #2 Operating		
Header Line #3 Operating		
All Header Lines Operating		

Comments

Table 2
Applied Induced Vacuum/Perimeter Air Monitoring Log Sheet
Klockner and Klockner
Rockaway, NJ
TRC Project #: 163292

		Header Operating Upon Arrival to Site	
Date:	TRC Personnel:	Header 1	
Arrival Time:		Header 2	
Departure Time:	Weather:	Header 3	

Objective:

Header Operating Times												
	Header 1				Header 2				Header 3			
Start												
Stop												

Applied/Induced Vacuum Readings

	Location	Time	Vacuum	Time	Vacuum	Time	Vacuum	Time	Vacuum	Diff. Pressure (in. H2O)	Flow Rate (scfm)
Header 1	SVE-3										
	SVE-2										
	SVE-5										
	SVE-8										
	VP-15										
	VP-16										
	VP-17										
	VP-18										
	VP-19										
	VP-20										
	VP-21										
	VP-22										
Header 2	SVE-1										
	SVE-4										
	SVE-6										
	SVE-7										
	VP-1										
	VP-2										
	VP-3										
	VP-4										
	VP-5										
	VP-6										
	VP-7										
	VP-8										
Header 3	SVE-11										
	VET-1										
	SVE-10										
	SVE-9										
	VP-8										
	VP-9										
	VP-10										
	VP-11										
	VP-12										
	VP-13										
	VP-14										
	VP-23										
	VP-24										
	VP-25										

Perimeter Air Monitoring Locations									
	PM-1	PM-2	PM-3	PM-4	PM-5	PM-6	PM-7	PM-8	PM-9
Reading									
Time									

TABLE 3
SVE SYSTEM LOG SHEET
ROCKAWAY BOROUGH WELLFIELD SUPERFUND SITE
OU-3: KLOCKNER & KLOCKNER SOURCE AREA
ROCKAWAY, NEW JERSEY

Site Name: Klockner & Klockner TRC Personnel: _____ Page: ____ of: ____

Project No.: 163292 Objective: _____

Date: _____ VLS Level: _____

Weather: _____ Visible Emissions: _____ (Exclusive of water vapor)

System: SVE

Date/Time	Vacuum at Manifold	Flow Meter	Influent Temp	Knockout Tank Vacuum	Pre-Filter Vacuum	Post-Filter Vacuum	Differential Pressure	Blower Flow Rate	Operating Headers	Effluent Temp	Effluent Pressure	Influent PID	Mid Carbon PID	Effluent PID	SVE Blower	VLS Pump	Dilution Valve
	inches of H_2O	scfm	°F	inches of H_2O	inches of H_2O	inches of H_2O	inches of H_2O	scfm	#	°F	inches of H_2O	ppm	ppm	ppm	hours	hours	% Open

Header 1: **SVE-2, SVE-3, SVE-5, SVE-8** **Header 2:** **SVE-1, SVE-4, SVE-6, SVE-7** **Header 3:** **VET-1, SVE-9, SVE-10, SVE-11**

Notes:

NR = Not Recorded
NA = Not Applicable

APPENDIX D

BUILDING 12 SVE WELL, VP, AND VET CONSTRUCTION LOGS

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER

VET-1

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** Goldstar Environmental

DATE EXCAVATED: **08/26/10**

SAMPLER TYPE/DIA.: Excavation **DEPTH TO WATER:**

OPERATOR **Mike Trappett**

BORING METHOD: Backhoe **TOTAL DEPTH :** 7'

LOGGED BY: **PHOTO LOGGED**

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	CONSTRUCTION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
1			ND	ASPHALT		0 to 0.5' - Asphalt
				BAKFILL WITH EXCAVATED TRENCH SPOILS		0.5-4.5' - Fill: Silty Sand, little coarse gravel, noted a cavity (dry well) cased with bricks at 3.5' on the East Side of the trench
6				GRAVEL		4.5 to 7.0' - Brown fine to medium sand, little silt, some coarse gravel
8						END OF TRENCH AT 7' Note: Gravel backfill is 3/4" (5.5' to 7') 4"-diameter, 0.010"- slotted pipe placed at 6.5' below grade

NORTHING	EASTING	GROUND ELEVATION
ft. msl	ft. msl	ft. msl
755,229.65	490,634.35	523.10

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
SVE-1
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/31/10**
FINISH DATE: **08/31/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Soil vapor extraction
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							
7							At ~7: Backfill material (glass) and dark brown silt and fine to coarse sand with gravel
8							
9							Well construction details:
10							0-2.5' : 4" PVC riser with male adapter
11							2.5-11' : 4" PVC screen
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 4" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,261.0 / 490,604.10 ft., msl
GROUND SURFACE ELEVATION: 523.50 ft., msl

TRC **Environmental Corporation**

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

SVE-2

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/05/12**

FINISH DATE: **11/05/12**

DRILLER: **Steve Moylan**

LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0 to 5' - Brown fine SAND, little coarse gravel.
2							
3							
4							
5							
6			0				5 to 8' - Brown fine SAND, little fine gravel.
7							
8							
9			0				8 to 14' - Brown fine to medium SAND.
10							Well Construction Details 0 to 3.5 ft. below surface - 4" diameter PVC riser 3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen
11							0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix 2.5 to 3.0 ft. below surface - Bentonite seal
12							3.0 to 14 ft. below surface - No. 0 sand
13							
14							
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,117 / 490,525 ft., msl

GROUND SURFACE ELEVATION: 523.00 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
SVE-3
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/06/12**
FINISH DATE: **11/06/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: SVE
DEPTH TO BEDROCK: NA
DRILLING METHOD: Hollow Stem Auger
TOTAL DEPTH DRILLED: 14 feet
BIT TYPE: Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0 to 2' - Backfill material.
2			0				2 to 5' - Coarse GRAVEL, some sand.
3							
4							
5							
6			0				5 to 8' - Brown medium to fine SAND, little fine gravel, dry.
7							
8							
9			0				8 to 14' - Brown fine SAND, dry.
10							Well Construction Details 0 to 3.5 ft. below surface - 4" diameter PVC riser
11							3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
12							2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 14 ft. below surface - No. 0 sand
13							
14							
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)
INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,167 / 490549 ft., msl
GROUND SURFACE ELEVATION: 522.80 ft., msl

TRC **Environmental Corporation**

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

SVE-4

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/09/12**

FINISH DATE: **11/09/12**

DRILLER: **Steve Moylan**

LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Vacuum

TOTAL DEPTH DRILLED: 13 feet **BIT TYPE:** NA

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0.5 to 4' - Brown medium to fine SAND, some coarse gravel.
2							
3							
4							4 to 10' - Brown fine SAND.
5							
6							
7							
8							10 to 13' - Brown fine SAND, little gravel, dry.
9							
10							Well Construction Details 0 to 3.5 ft. below surface - 4" diameter PVC riser 3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen
11							0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix 2.5 to 3.0 ft. below surface - Bentonite seal
12							3.0 to 13.5 ft. below surface - No. 0 sand
13							
14							End of boring at 13.5 feet below surface.
15							

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: ND feet below surface

DEPTH WATER ENCOUNTERED: 13.00 feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,203 / 490,533 ft., msl

GROUND SURFACE ELEVATION: 522.90 ft., msl

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

SVE-5

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/07/12**

FINISH DATE: **11/07/12**

DRILLER: **Steve Moylan**

LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0.5 to 2' - Brown fine SAND, little coarse gravel.
2							
3			0				2 to 6' - Brown fine SAND, dry, little coarse gravel.
4							
5							
6							
7			0				6 to 10' - Light brown fine SAND, dry.
8							
9							
10							
11			0				10 to 14' - Light brown fine SAND, little fine gravel.
12							Well Construction Details
13							0 to 3.5 ft. below surface - 4" diameter PVC riser
14							3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen
15							0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
							2.5 to 3.0 ft. below surface - Bentonite seal
							3.0 to 14 ft. below surface - No. 0 sand
							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,104 / 490,569 ft., msl

GROUND SURFACE ELEVATION: 522.90 ft., msl

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

SVE-6

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/02/12**
FINISH DATE: **11/02/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE
DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger
TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0 to 2' - Backfill material.
2			0				2 to 4' - Dark brown medium to fine SAND, little silt and clay.
3							
4			0				4 to 5' - Coarse GRAVEL, some sand.
5			1.1				5 to 10' - Brown fine to medium SAND, little fine gravel, dry.
6							
7							
8							
9							
10			0				10 to 14' - Brown fine to medium SAND, dry.
11							Well Construction Details
12							0 to 3.5 ft. below surface - 4" diameter PVC riser 3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen
13							0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix 2.5 to 3.0 ft. below surface - Bentonite seal
14							3.0 to 14 ft. below surface - No. 0 sand
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,175 / 490,584 ft., msl

GROUND SURFACE ELEVATION: 525.40 ft., msl

Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

SVE-7

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/07/12**

FINISH DATE: **11/07/12**

DRILLER: **Steve Moylan**

LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0.5 to 1' - Backfill material.
2			0				1 to 4' - Backfill material, large boulders of concrete.
3							
4							
5			0				4 to 6' - Brown fine to medium SAND, little coarse gravel.
6							
7			0				6 to 14' - Brown fine SAND, dry.
8							Well Construction Details 0 to 3.5 ft. below surface - 4" diameter PVC riser
9							3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
10							2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 14 ft. below surface - No. 0 sand
11							
12							
13							
14							
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,205 / 490,578 ft., msl

GROUND SURFACE ELEVATION: 522.90 ft., msl

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

SVE-8

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/08/12**

FINISH DATE: **11/08/12**

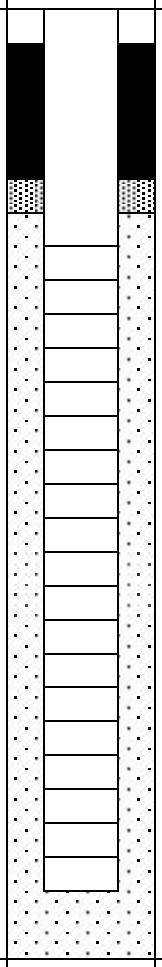
DRILLER: **Steve Moylan**

LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0.5 to 3' - Backfill material, coarse gravel, brown medium sand.
2							
3							
4			0				3 to 8' - Brown medium to fine SAND, little fine gravel.
5							
6							
7							
8							
9			1.8				8 to 14' - Brown fine SAND, dry.
10							Well Construction Details 0 to 3.5 ft. below surface - 4" diameter PVC riser
11							3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
12							2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 14 ft. below surface - No. 0 sand
13							
14							
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,086 / 490,631 ft., msl

GROUND SURFACE ELEVATION: 522.80 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
SVE-9
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/14/12**
FINISH DATE: **11/14/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: SVE
DEPTH TO BEDROCK: NA
DRILLING METHOD: Hollow Stem Auger
TOTAL DEPTH DRILLED: 14 feet
BIT TYPE: Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0 to 1' - Dark brown fine to medium SAND.
2			0				1 to 13.5' - Light brown fine SAND, dry.
3							
4							
5							
6							
7							
8							Well Construction Details 0 to 3.5 ft. below surface - 4" diameter PVC riser
9							3.5 to 13.5 ft. below surface - 4" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
10							2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 14 ft. below surface - No. 0 sand
11							
12							
13							
14			0				13.5 to 14' - Brown fine SAND, wet.
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)
INNER: 4 OUTER: NA

STATIC WATER LEVEL: ND feet below surface
DEPTH WATER ENCOUNTERED: 13.50 feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13.5
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,138 / 490,608 ft., msl
GROUND SURFACE ELEVATION: 523.10 ft., msl

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WELL LOG

WELL NUMBER

SVE-10

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** Goldstar

START DATE: **02/14/13**

FINISH DATE: **02/14/13**

DRILLER: **Mike**

LOGGED BY: **C. Georgiadis**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0 to 2"- Not backfilled; will be paved 0"-3" with asphalt
2							2" to 2.5' - Clean fill DGA from excavation activities
3							
4							
5							
6			0				2.5 to 8' - Brown-tan fine SAND, little fine gravel.
7							
8							
9			0				8 to 14' - Brown fine to medium SAND.
10							Well Construction Details
11							0 to 3 ft. below surface - 4" diameter PVC riser 3 to 13 ft. below surface - 4" diameter 10 slot PVC screen
12							0.5 to 2 ft. below surface - Portland cement/Bentonite mix 2 to 2.5 ft below surface- Bentonite seal
13							2.5 to 14 ft. below surface - No. 0 sand
14							
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3 to 13
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,183/490,618 ft., msl

GROUND SURFACE ELEVATION: 521.57 ft., msl

TRC Job No. 163292

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WELL LOG

WELL NUMBER

SVE-11

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** ECDI

START DATE: **11/13/12**

FINISH DATE: **11/13/12**

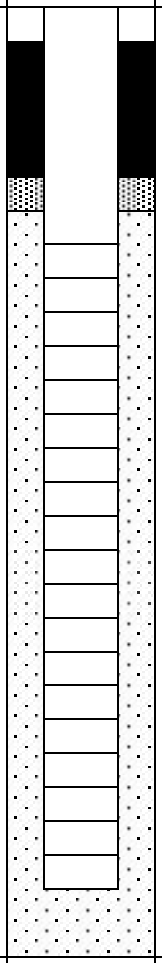
DRILLER: **Steve Moylan**

LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA **TYPE OF WELL:** SVE

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 14 feet **BIT TYPE:** Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0.5 1 0.5				0 to 2" - Asphalt 2" to 0.5' - Brown fine to medium SAND, some fine gravel. 0.5 to 7' - Brown fine SAND, some fine gravel.
2							
3							
4							
5							
6							
7							
8			0.5				7 to 14' - Brown fine SAND, some fine gravel. Well Construction Details
9							0 to 3.5 ft. below surface - 4" diameter PVC riser
10							3.5 to 13 ft. below surface - 4" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
11							2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 14 ft. below surface - No. 0 sand
12							
13							
14							
15							End of boring at 14 feet below surface.

CASING TYPE/DIAMETER (IN.)

INNER: 4 OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 13.5
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,238 / 490,606 ft., msl

GROUND SURFACE ELEVATION: 522.80 ft., msl

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WELL LOG

WELL NUMBER

VP-1

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None **TYPE OF WELL:** Vapor Monitoring
DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger
TOTAL DEPTH DRILLED: 11 feet **BIT TYPE:** Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							Refusal at 2'- offset 2-3' west of original location - refusal again at 2'- offset again 2-3' toward VP-4 2-11': No. 0 Sand pack
4							
5							
6							Well construction details: 0-2.5' : 1" PVC riser 2.5-11' : 1" PVC screen
7							
8							
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)

INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,264.30 / 490,592.98 ft., msl

GROUND SURFACE ELEVATION: 523.50 ft., msl

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WELL LOG

WELL NUMBER
VP-2
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/26/10**
FINISH DATE: **08/26/10**
DRILLER: **Mike Trappett**
LOGGED BY: **RB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,281.97 / 490,607.55 ft., msl
GROUND SURFACE ELEVATION: 524.30 ft., msl

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WELL LOG

WELL NUMBER

VP-3

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None **TYPE OF WELL:** Vapor Monitoring
DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger
TOTAL DEPTH DRILLED: 11 feet **BIT TYPE:** Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)

INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,267.90 / 490,605.67 ft., msl

GROUND SURFACE ELEVATION: 523.70 ft., msl

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WELL LOG

WELL NUMBER
VP-4
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,262.42 / 490,599.03 ft., msl
GROUND SURFACE ELEVATION: 523.50 ft., msl

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WELL LOG

WELL NUMBER
VP-5
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,246.57 / 490,600.22 ft., msl
GROUND SURFACE ELEVATION: 523.00 ft., msl

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WELL LOG

WELL NUMBER
VP-6
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,255.64 / 490,602.89 ft., msl
GROUND SURFACE ELEVATION: 523.30 ft., msl

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WELL LOG

WELL NUMBER
VP-7
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout Obstruction at 1.5' - offset to west of original location
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details: 0-2.5' : 1" PVC riser 2.5-11' : 1" PVC screen
7							
8							
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered; Original VP-7 location backfilled
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,259.22 / 490,612.48 ft., msl
GROUND SURFACE ELEVATION: 523.60 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
VP-8
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/31/10**
FINISH DATE: **08/31/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack VP-8 offset 7' east from original location due to access issues.
4							
5							
6							Well construction details: 0-2.5' : 1" PVC riser
7							2.5-11' : 1" PVC screen
8							
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,255.09 / 490,632.87 ft., msl
GROUND SURFACE ELEVATION: 523.90 ft., msl

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WELL LOG

WELL NUMBER
VP-9
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,236.67 / 490,638.59 ft., msl
GROUND SURFACE ELEVATION: 523.40 ft., msl

TRC Environmental Corporation
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WELL LOG

WELL NUMBER
VP-10
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/25/10**
FINISH DATE: **08/25/10**
DRILLER: **Mike Trappett**
LOGGED BY: **RB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							Refusal at 4'; Offset 2' north of original location, continue drilling to 11'
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,230.46 / 490,646.88 ft., msl
GROUND SURFACE ELEVATION: 523.50 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
VP-11
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/25/10**
FINISH DATE: **08/25/10**
DRILLER: **Mike Trappett**
LOGGED BY: **RB**

SAMPLER TYPE/DIA.: None
NORTHING:
TYPE OF WELL: Vapor Monitoring
DEPTH TO BEDROCK: NA
EASTING:
DRILLING METHOD: Hollow Stem Auger
TOTAL DEPTH DRILLED: 11 feet
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,227.58 / 490,651.29 ft., msl
GROUND SURFACE ELEVATION: 523.70 ft., msl

TRC **Environmental Corporation**

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WELL LOG

WELL NUMBER

VP-12

WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner **LOCATION:** Rockaway, New Jersey

PROJECT NO.: 163292 **CONTRACTOR:** Goldstar Environmental

START DATE: **08/31/10**

FINISH DATE: **08/31/10**

DRILLER: **Mike Trappett**

LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None **TYPE OF WELL:** Vapor Monitoring

DEPTH TO BEDROCK: NA **DRILLING METHOD:** Hollow Stem Auger

TOTAL DEPTH DRILLED: 11 feet **BIT TYPE:** Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)

INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface

DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,230.33 / 490,653.93 ft., msl

GROUND SURFACE ELEVATION: 523.90 ft., msl

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WELL LOG

WELL NUMBER
VP-13
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/30/10**
FINISH DATE: **08/30/10**
DRILLER: **Mike Trappett**
LOGGED BY: **SB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 11 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack Large void at 3'- 8 bags of sand to fill; Well re-drilled on 8/30/10 with 6" augers
4							
5							
6							Well construction details: 0-2.5' : 1" PVC riser
7							2.5-11' : 1" PVC screen
8							
9							
10							
11							
12							End of drilling at 11'; Well set at 11' ; Water not encountered
13							
14							
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,225.27 / 490,627.17 ft., msl
GROUND SURFACE ELEVATION: 522.70 ft., msl

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WELL LOG

WELL NUMBER
VP-14
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar Environmental

START DATE: **08/25/10**
FINISH DATE: **08/25/10**
DRILLER: **Mike Trappett**
LOGGED BY: **RB**

SAMPLER TYPE/DIA.: None
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 15 feet
TYPE OF WELL: Vapor Monitoring
DRILLING METHOD: Hollow Stem Auger
BIT TYPE: Auger bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							0-1.5': Cement Grout
2							1.5-2' : Bentonite seal
3							2-11': No. 0 Sand pack
4							
5							
6							Well construction details:
7							0-2.5' : 1" PVC riser
8							2.5-11' : 1" PVC screen
9							
10							
11							
12							Well set at 11'
13							Static DTW at 11.8'
14							
15							End of drilling at 15'

CASING TYPE/DIAMETER (IN.)
INNER: 1" OUTER: NA

STATIC WATER LEVEL: 11.8 (8/25/10) feet below surface
DEPTH WATER ENCOUNTERED: 12.16 feet below surface

SCREENED OR OPEN INTERVAL: 2.5-11
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,205.38 / 490,630.69 ft., msl
GROUND SURFACE ELEVATION: 522.70 ft., msl

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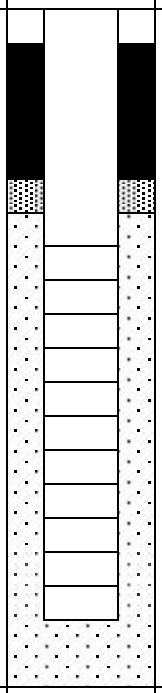
WELL LOG

WELL NUMBER
VP-15
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/05/12**
FINISH DATE: **11/05/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details

0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,112 / 490515 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

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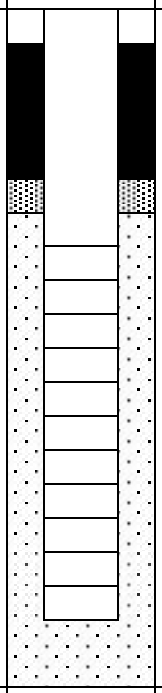
WELL LOG

WELL NUMBER
VP-16
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/06/12**
FINISH DATE: **11/06/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Direct Push
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details
0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,167 / 490,534 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

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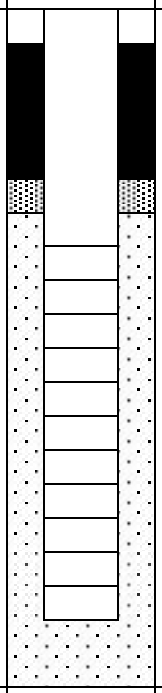
WELL LOG

WELL NUMBER
VP-17
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/09/12**
FINISH DATE: **11/09/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details
0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,228 / 490,546 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

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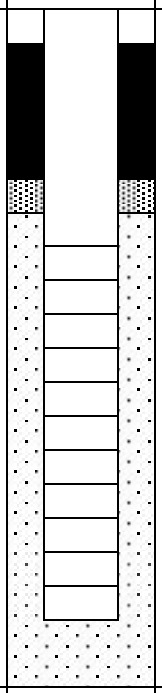
WELL LOG

WELL NUMBER
VP-18
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/08/12**
FINISH DATE: **11/08/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1							Soil cuttings were not produced, therefore lithology was not recorded.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							End of boring at 10 feet below surface.
12							Well Construction Details 0 to 3.5 ft. below surface - 1" diameter PVC riser
13							3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
14							2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 10 ft. below surface - No. 0 sand
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,080 / 490,574 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

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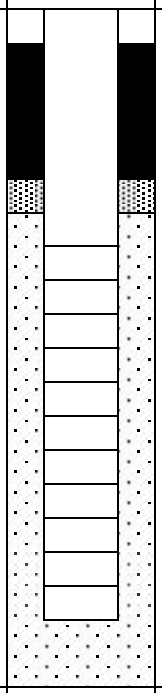
WELL LOG

WELL NUMBER
VP-19
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/02/12**
FINISH DATE: **11/02/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details

0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,125 / 490,586 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

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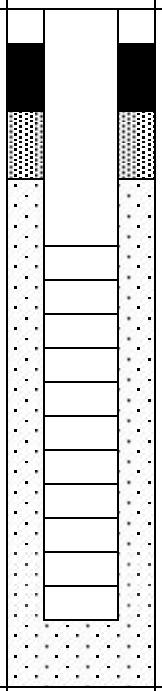
WELL LOG

WELL NUMBER
VP-20
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/05/12**
FINISH DATE: **11/06/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Direct Push
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details
0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 1.5 ft. below surface - Portland cement/Bentonix mix
1.5 to 2.5 ft. below surface - Bentonite seal
2.5 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,167 / 490,569 ft., msl
GROUND SURFACE ELEVATION: 522.80 ft., msl

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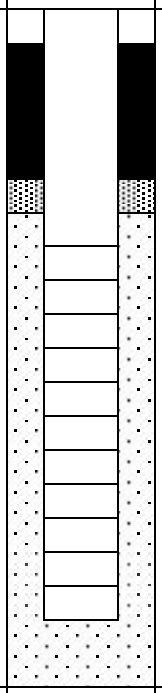
WELL LOG

WELL NUMBER
VP-21
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/01/12**
FINISH DATE: **11/01/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details
0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,215 / 490,604 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

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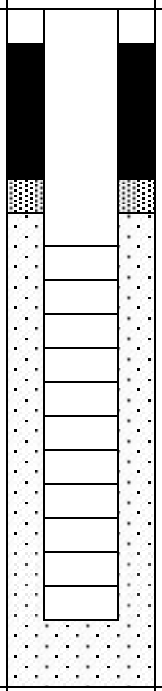
WELL LOG

WELL NUMBER
VP-22
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/05/12**
FINISH DATE: **11/05/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface. Well Construction Details 0 to 3.5 ft. below surface - 1" diameter PVC riser 3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen 0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix 2.5 to 3.0 ft. below surface - Bentonite seal 3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,072 / 490,655 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

TRC Environmental Corporation
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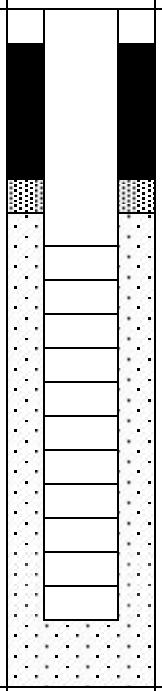
WELL LOG

WELL NUMBER
VP-23
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/14/12**
FINISH DATE: **11/14/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details
0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,134 / 490,614 ft., msl
GROUND SURFACE ELEVATION: 522.90 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
VP-24
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: Goldstar

START DATE: **02/14/13**
FINISH DATE: **02/14/13**
DRILLER: **Mike**
LOGGED BY: **C. Georgiadis**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: VP
DEPTH TO BEDROCK: NA
DRILLING METHOD: Hollow Stem Auger
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Auger Bit

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1			0				0 to 2"- Not backfilled; will be paved 0"-3" with asphalt
2							2" to 3.5' - Clean fill DGA from excavation activities
3							
4							
5							
6			0				3.5 to 8' - Brown-tan fine SAND, little fine gravel.
7							
8							
9			0				8 to 10' - Brown fine to medium SAND.
10							
11							End of boring at 10 feet below surface.
12							Well Construction Details
13							0 to 4 ft. below surface - 1" diameter PVC riser 4 to 9 ft. below surface - 1" diameter 10 slot PVC screen 0.5 to 3 ft. below surface - Portland cement/Bentonix mix
14							3 to 3.5 ft. below surface - Bentonite seal 3.5 to 10 ft. below surface - No. 0 sand
15							

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 4 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,177/490,625 ft., msl
GROUND SURFACE ELEVATION: 522.33 ft., msl

TRC Job No. 163292
W:\Vision Project Folders\163292\Documents_WIP\Reports_WIP\RA-Construction\Documentation & Reporting\Well Construction Logs\Feb 2013- VP24, SVE10 rev1.xls

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

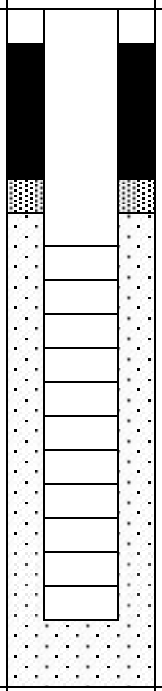
WELL LOG

WELL NUMBER
VP-25
WELL PERMIT NUMBER

PROJECT NAME: Klockner & Klockner
LOCATION: Rockaway, New Jersey
PROJECT NO.: 163292
CONTRACTOR: ECDI

START DATE: **11/13/12**
FINISH DATE: **11/13/12**
DRILLER: **Steve Moylan**
LOGGED BY: **K. Lau**

SAMPLER TYPE/DIA.: NA
TYPE OF WELL: Monitoring
DEPTH TO BEDROCK: NA
DRILLING METHOD: Direct Push
TOTAL DEPTH DRILLED: 10 feet
BIT TYPE: Prepoint probe tip

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Flush Mount
1–10							Soil cuttings were not produced, therefore lithology was not recorded.
11–15							End of boring at 10 feet below surface.

Well Construction Details
0 to 3.5 ft. below surface - 1" diameter PVC riser
3.5 to 9 ft. below surface - 1" diameter 10 slot PVC screen
0.5 to 2.5 ft. below surface - Portland cement/Bentonix mix
2.5 to 3.0 ft. below surface - Bentonite seal
3.0 to 10 ft. below surface - No. 0 sand

CASING TYPE/DIAMETER (IN.)
INNER: 1 OUTER: NA

STATIC WATER LEVEL: NA feet below surface
DEPTH WATER ENCOUNTERED: NA feet below surface

SCREENED OR OPEN INTERVAL: 3.5 to 9
(FEET BELOW SURFACE)

NORTHING /EASTING: 755,284 / 490,657 ft., msl
GROUND SURFACE ELEVATION: 523.00 ft., msl

APPENDIX E

BLOWER OWNER'S MANUAL

Spencer® Vortex® Regenerative Blowers

Serial No:	7003001
Model No:	VB075B-10H

Installation, Operation and Maintenance Instructions

VB007

VB055

Important

Read and become familiar with this manual prior to uncrating and installing your Spencer Vortex Blower. Following the instructions detailed here will help you realize its full potential of efficient service and extended lifespan. Damage resulting from failure to follow correct procedure will void the warranty.

Contents

I. General

Scope
Information contained in this manual relates to Vortex Blowers standard and explosion-proof motor models VB001S, VB001, VB002S, VB002, VB003S, VB003, VB004S, VB004, VB007S, VB007, VB019S, VB019, VB030S, VB030, VB037S, VB037, VB055, VB075, and VB110.

Limited Warranty
We warrant that this product will be free from defects in material and workmanship for a period of 18 months from date of shipment or 12 months from date of startup, whichever comes first. Within the warranty period, we shall repair or replace F.O.B. our Factory such products that are determined by us to be defective.

This warranty will not apply to any product which has been subjected to misuse, negligence, or accident, or misapplied or improperly installed. This warranty will not apply to any product which has been disassembled, repaired, or otherwise altered by any persons not authorized by the Spencer Vortex Service Department.

On units which include thermal protection, the thermal protection must be connected as recommended.

The guarantee of the motor and control manufacturers will govern the extent of our guarantee on such equipment. Warranty work on motors and controls must be authorized by Spencer and must be performed in an authorized shop as designated by the manufacturers.

The Spencer Turbine Company reserves the right to invoice all expenses incurred when repairs are made in the field at the specific request of the customer.

No assemblies or parts of assemblies will be accepted for repair or replacement under this warranty without prior authorization by The Spencer Turbine Company. For complete warranty information, obtain Spencer's Form 706, "Terms and Conditions of Sales."

Safety Precautions
Power sources, protective devices, and grounding provisions must be in accordance with wiring instructions provided in this manual.

Blower becomes hot during operation and may cause burns if touched.

Do not operate the blower under load conditions which exceed the rated full-load amps on the nameplate.

Do not install the blower in any area which may have an explosive atmosphere or which may contain flammable gases or liquids. Always provide proper ventilation. Do not install in any area which may subject the blower to corrosive liquids. Excessive moisture may cause electrical failure; install the blower in areas free from water or rain. Do not operate blower without motor cooling fan cover, or without impeller end cover.

Before installing blowers with explosion-proof motors, the buyer must check federal, state and local codes to see if such motors are appropriate for the intended application environment. It is the buyer's responsibility to determine the suitability of any product for a particular purpose.

Storage
If machine is to be stored for an extended period of time, it must be carefully protected from dampness and dirt.

II. Installation

Locating, Mounting, Connecting
Ambient temperature at the installed location should not be less than -5˚ F or greater than 104˚ F. Relative humidity should not exceed 80%.

Mount the blower in a horizontal or vertical position as shown in Figure 1. For models VB055, VB075 and VB110, it is recommended to mount in the horizontal position only. Check with factory *prior* to mounting these models vertically.

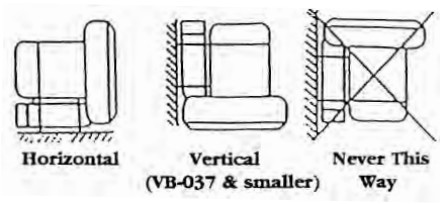


Fig. 1 Mounting Positions

Remove protective coverings, such as vinyl tape or plastic plugs, from the inlet and outlet ports. Models VB001, VB002 and VB003 are supplied with a patented (U.S. Patent 5,791,870) reversible flange with threaded pipe or tubing connections. Avoid excessive stress caused by pipe connector tightening or by misaligned pipe on the inlet and outlet ports. Support piping by brackets or other means.

In the event the blower is located where dust, fibers, drops of water, or other particulates may be in the airstream, use a filter on the suction side of the piping. If foreign matter enters the impeller, it may clog, jam, or otherwise impair the blower performance.

Wiring

Caution: Confirm that the power source is the same as that indicated on the unit's nameplate. Application of incorrect voltage or improper phase connection may cause motor failure or other damage.

Use conductors and devices (such as the circuit breakers, starters, and switches shown in Figure 3) that are suitable for the applications shown in Tables 1 and 2 and are in compliance with the National Electric Code and applicable local codes and regulations. Motor terminal connections are shown below Table 1.

Provide protection from overheating of the motor windings. Some models are equipped with built-in thermal protectors (see Table 1). Where applicable, connect the leads from the pilot-duty thermal protector to the magnetic starter as shown in Fig. 3.

Check the direction of rotation of the blower.
To reverse the direction or rotation:

1) for a single-phase motor, interchange motor leads 5 and 8.
2) for a three-phase motor, interchange any two of the three line connections.

Caution: Install a properly-sized overload device and disconnect in accordance with local codes and regulations and dedicated only to the Vortex Blower.

Furnish the Vortex Blower and all associated electrical devices with a proper ground in accordance with all local codes and regulations.

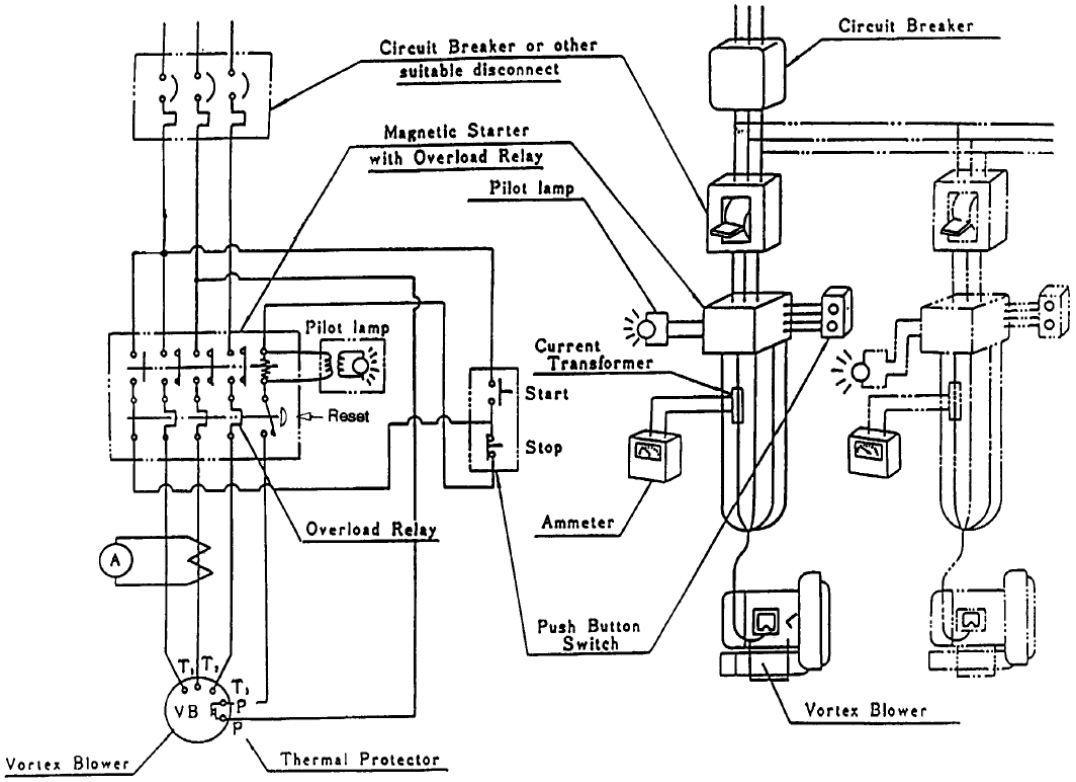


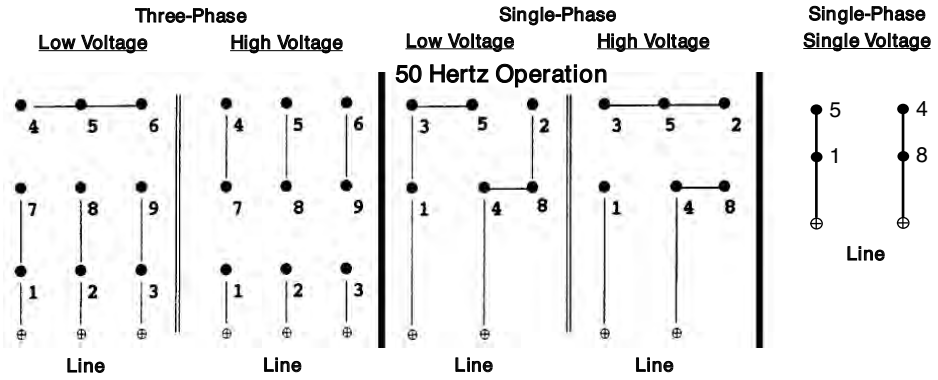
Fig. 3 Typical Wiring Diagram

Table 1 Three-Phase Motor Data - Typical Values

60 Hertz Operation						
Model No.	**VB001**	**VB002**	**VB003**	**VB004**	**VB007**	**VB019**
Power (hp)	0.13	0.25	0.5	0.75	1.5	2.5
Voltage (V)	200-230/460	200-230/460	208-230/460	200-230/460	200-230/460	200-230/460
FL Amp (A)	.5-.48/.24	.86-.73/.37	1.8-1.6/.8	2.3-2.4/1.2	4.3-4/2	7.2-6.6/3.3
Voltage (V)		575	575	575	575	575
FL Amp (A)		.4	0.8	0.96	1.4	2.1
Model No.	**VB030**	**VB037**	**VB055**	**VB075**	**VB110**	—
Power (hp)	4	5	7.5	10	15	—
Voltage (V)	200-230/460	200-230/460	200-230/460	200-230/460	200-230/460	—
FL Amp (A)	10.6-10.2/5.1	13.2-12/6	19.8-17.2/8.6	27.5-27.2/13.6	39-37/18.5	—
Voltage (V)	575	575	575	575	575	—
FL Amp (A)	3	4.8	7	9.6	13.5	—
50 Hertz Operation						
Model No.	**VB001**	**VB002**	**VB003**	**VB004**	**VB007**	**VB019**
Power (hp)	0.13	0.21	0.5	0.63	1.25	2.1
Voltage (V)	190-220/380-415	190-220/380-415	190/380-415	190/380-415	190/380-415	190/380-415
FL Amp (A)	.5-.52/.25-.26	.74-.66/.37-.34	2/1-.9	2.4/1.2-1.3	4/2	6.6/3.3-3.1
Model No.	**VB030**	**VB037**	**VB055**	**VB075**	**VB110**	—
Power (hp)	3.4	4.2	6.25	8.33	12.5	—
Voltage (V)	190/380-415	190/380-415	190/380-415	190/380-415	190/380-415	—
FL Amp (A)	10.2/5.2-5.1	11.8/5.9-5.6	17.6/8.8-8.2	27/13.5-14.5	36/18-17	—

NOTE: Thermostats are provided on the VB004 and larger models.

MOTOR WIRING



NOTES: (1) For three-phase, interchange any two line connections to reverse shaft rotation
(2) For single-phase, interchange motor leads 5 and 8 to reverse shaft rotation

THERMOSTATS VB004 AND LARGER

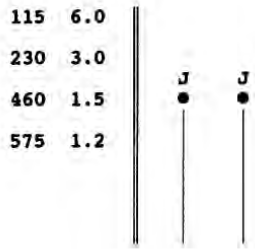


Table 2 Single-Phase Motor Data - Typical Values

60 Hertz Operation								
Model No.	**VB001S**	**VB002S**	**VB003S**	**VB004S**	**VB007S**	**VB019S**	**VB030S**	**VB037S**
Power (hp)	0.13	0.25	0.5	0.75	1.5	2.5	4	5
Voltage (V)	115/230	115/230	115/230	115/208-230	115/208-230	115/208-230	115/208-230	230
FL Amps (A)	1.25/.63	2.3/1.15	5.2/2.6	9.6/5-4.8	13.4/6.7	22/11.5-11	34.8/18.5-17.4	20.8
50 Hertz Operation								
Model No.	**VB001S**	**VB002S**	**VB003S**	**VB004S**	**VB007S**	**VB019S**	**VB030S**	**VB037S**
Power (hp)	0.13	0.21	0.5	0.63	1.25	2.1	3.3	4.2
Voltage (V)	110/220	110/220	110/220	100-110/220	110/220	100-110/220	100-110/220	220
FL Amps (A)	1.34/.67	2.1/1.05	5.6/2.8	9.9-11.6/5.8	15.4/7.7	22-21/10.5	42-38.6/19.3	19

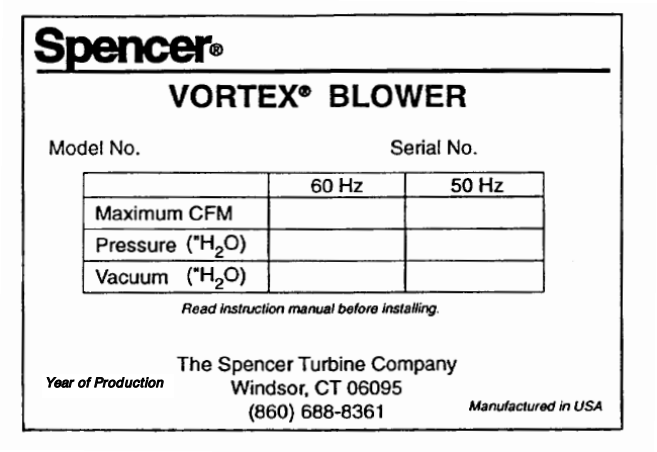


Fig. 4 Typical Nameplate

III. Operation

Limits of Operation

Operation at flows less than those indicated by the solid line on the applicable performance curve will cause overheating of the unit and is to be avoided. **Throttling suction or discharge piping to reduce air volume increases differential pressure resulting in elevated temperature and increased power consumption. Use of pressure and/ or vacuum relief valve recommended.**

Maximum pressure and vacuum are indicated on the nameplate (see Fig. 4). These represent conditions at which the minimum allowable airflow (CFM) occurs. Check the operating pressure or vacuum to assure that the pressure or vacuum remains less than maximum.

For continuous operation at low air volume (on the dotted portion of the performance curve), provide a bypass in the piping and operate at a lower pressure than maximum operating pressure. See Performance Curves, Section V.

Caution: Low flow conditions may produce heat levels which may cause burns. Do not touch the blower in operation.

Temperature Rise

A NEMA Class F insulation system is used in the motor. Maximum allowable winding temperature is 265˚F. If a thermal protector or thermal relay activates because the temperature rise of the motor is higher than usual, investigate and correct the problem. Explosion-proof motors use a NEMA Class B insulation. Typical causes of motor overheating are given in Section VI, Troubleshooting Guide.

IV. Disassembly and Reassembly

A. General

1. Precautions should be taken when disassembling or reassembling the blower. See Warranty Terms.
2. Keep all parts clean.
3. Do not overtighten bolts and screws.

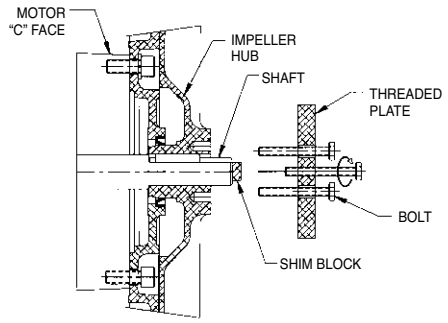


Fig. 5 Impeller Puller

B. Disassembly Procedure (Reassembly is performed in reverse order)

Caution: Shims are used to adjust the gap between the impeller and casing. When disassembling, take care to note the quantity of shims and their thickness. The shim stack replacement must be the correct thickness to assure proper clearance and to avoid degradation of performance.

1. Remove impeller cover; remove screws, pull cover away from case.
2. Unfasten lock washer; remove nut and washer.
3. Remove impeller from shaft by one of the following methods:
   a. manually pull the impeller outward, OR
   b. screw two bolts into tapped holes and pull on the bolts, OR (if the fit is tight)
   c. use a puller assembly (not furnished) as shown in Fig. 5.
4. Remove motor shaft key.
5. Remove case from motor; if necessary remove screws holding case to base and motor to case.
6. Remove shims from motor shaft if necessary; do not discard them. See Note above.

Caution: Motors are heavy. Lift motor on models larger than VB002 by the eyebolt on the motor with an aid from a lifting device.

C. Reassembly Guidance

1. The gap between the impeller and case is essential for proper performance of the unit. The shims between the shaft collar and impeller hub establish the spacing of this gap. In reassembly, before installing the impeller cover, check the gap between the impeller and case to assure that the measurement conforms to the gap specification on the assembly drawing (on the following pages) for your unit.

2. For models VB001, VB002 and VB003, gap clearance between impeller and unibody case should be checked around entire periphery of the impeller in accordance with Item 18, impeller to case gap specification prior to securing impeller.

3 On models VB004 thru VB110 remove Item 23 Plug located on bottom of the case and check impeller gap with a feeler gauge. Remove impeller and adjust shims to meet gap specification. With adjustments and gap check complete, replace plug tightly to prevent air leakage.

4. Fasten impellers using lockwashers and locknuts. Torgue locknut to recommended torque values in Table 3. Bend a lockwasher tab down into a lockwasher slot.

5. Reattach the impeller cover.

Catalog No.	Recommended Torque (Ft-Lb)
VB001, VB001S, VB002 VB002S, VB003, VB003S	22
VB004, VB004S	31
VB007, VB007S	36
VB019, VB019S	36
VB030, VB030S	44
VB037, VB037S	44
VB055	77
VB075	90
VB110	90

Table 3 Locknut Torque

V. Vortex Blower Data

Pages 7 through 17 present information about the various blower models. This information is important in understanding your blower's performance, in using the blower in the proper operating range, and in ordering parts that might be needed.

A. Assembly Diagrams

At the top of each page is an assembly diagram of the unit. Items are identified by circled numbers around the diagram. Above each diagram is the gap specification.

B. Parts Lists

At the lower left of each diagram is a table giving the item number (shown on the Assembly Diagram), the Part No. for that item and the corresponding part description. In ordering parts, provide the model number, the part number and the description.

C. Performance Curves

At the lower right of each diagram are performance curves for 50Hz and 60Hz operation. The curves present the following information:

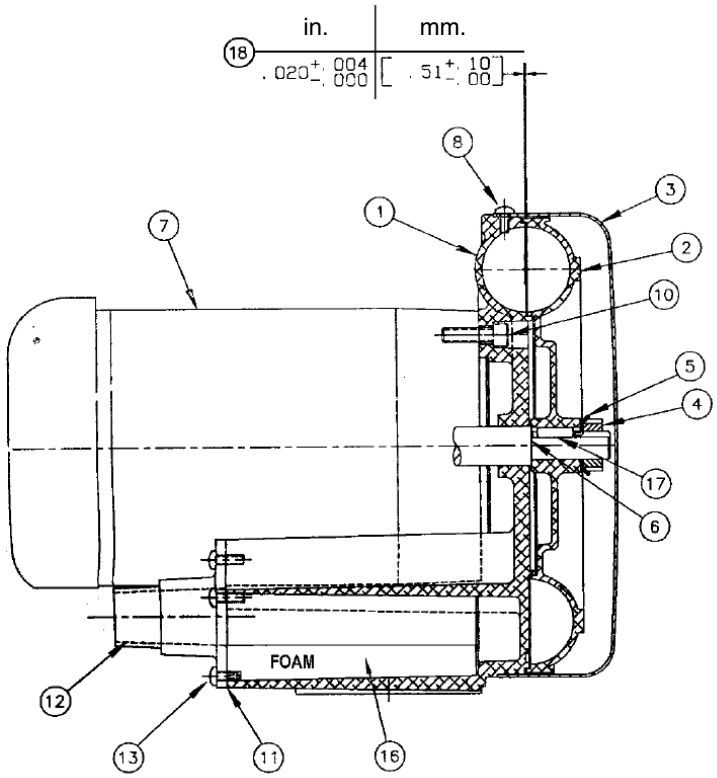
The upper line of each curve is pressure performance while the lower line is vacuum performance. The dashed portion at the left end of some of the curves indicates an intermittent-only operating area. See **Operation** Section on page 5.

D. Estimated Acoustical Noise Level at 1.5M, 60Hz

Model	dba
VB001S	62
VB001	61
VB002S	61
VB002	61
VB003S	66
VB003	66
VB004S	63
VB004	63
VB007S	70
VB007	64
VB019S	70
VB019	73
VB030S	71
VB030	73
VB037S	74
VB037	76
VB055	82
VB075	81
VB110	80

Spencer® Vortex® Regenerative Blowers
VB001S, VB001

Assembly Diagram

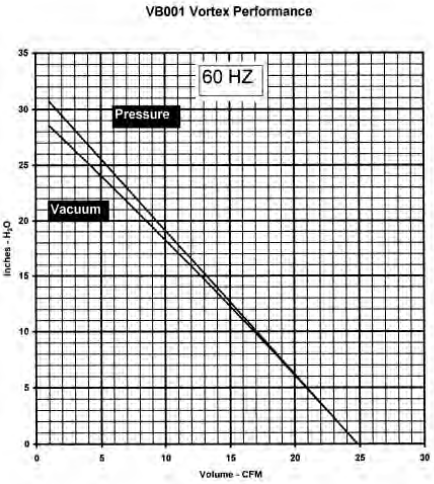


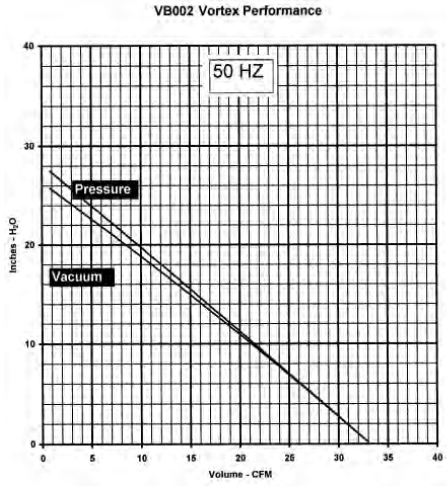
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB001S & VB001			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC90101	Case, Unibody	1
2	VBI90101	Impeller	1
3	VBE90101	Cover, Impeller	1
4	NUT90219	Locknut, Shaft	1
5	WSH90184	Lockwasher, Shaft	1
6	WSH90185	Shim, Shaft to Impeller (as required)	1
7	MOT90210	Motor 42C, 1/8 HP, 1PH, 50/60Hz	1
7A	MOT90215	Motor 42C, 1/8 HP, 3PH, 50/60Hz	1
8	SCR90901	M4 x 0.7 Pan Head Phillips Screw x .31 [8] Long	4
10	SCR90307	1/4-20 x .625" Long Socket Cap Screw	4
11	GSK90168	Gasket, Flange	1
12	FLC90013	Flange	1
13	SCR90888	M5 x 0.8 Hex Head Bolt x .63 [16] long	6
16	INS90014	Absorber	2
17	KEY90083	Key	1
18	N/A	Impeller to case gap specification	N/A

VB001S, VB001

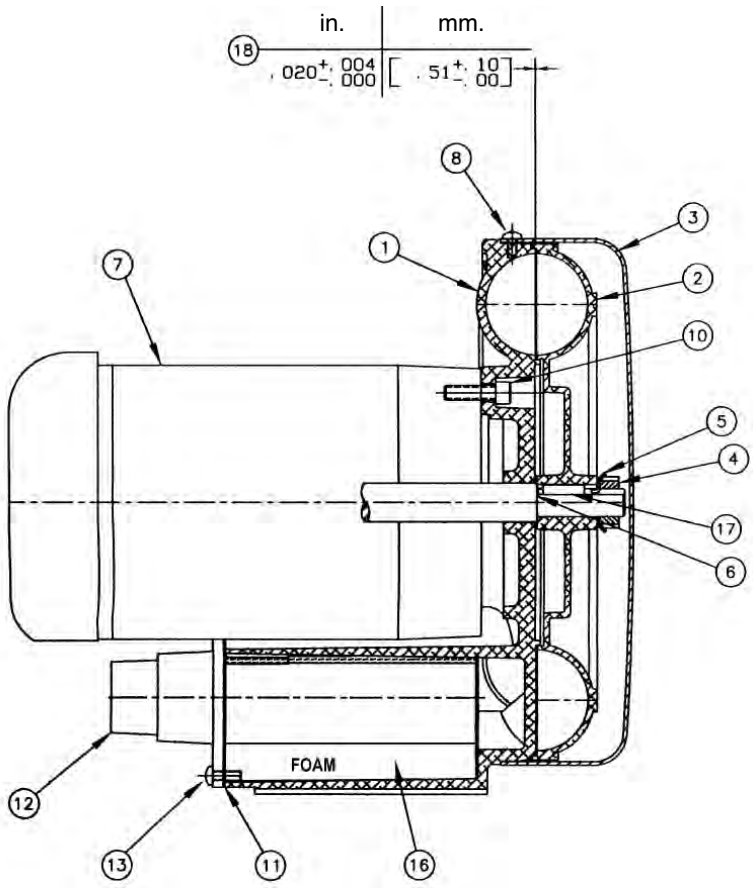
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB002S, VB002

Assembly Diagram

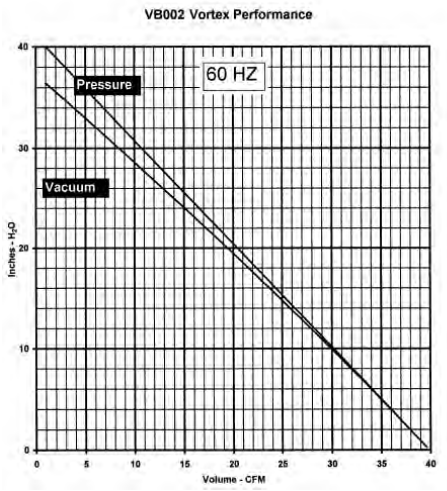


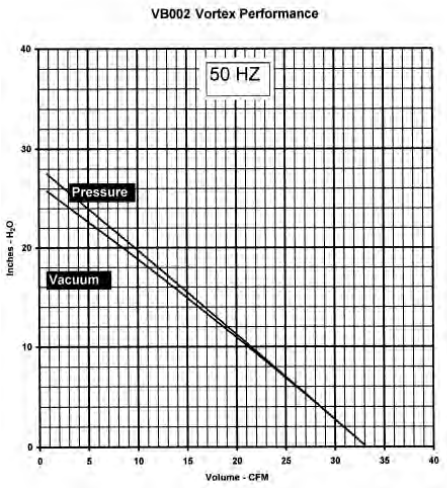
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB002S & VB002			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC90201	Case, Unibody	1
2	VBI90201	Impeller	1
3	VBE90201	Cover, Impeller	1
4	NUT90219	Locknut, Shaft	1
5	WSH90184	Lockwasher, Shaft	1
6	WSH90185	Shim, Shaft to Impeller (as required)	1
7	MOT90211	Motor 42C, 1/4 HP, 1PH, 50/60Hz	1
7A	MOT90212	Motor 42C, 1/4 HP, 3PH, 50/60Hz	1
8	SCR90901	M4 x 0.7 Pan Head Phillips Screw x .31 [8] Long	4
10	SCR90307	1/4-20 x .625" Long Socket Cap Screws	4
11	GSK90169	Gasket, Flange	1
12	FLC90014	Flange	1
13	SCR90888	M5 x 0.8 Hex Head Bolt x .63 [16] Long	6
16	INS90015	Absorber	2
17	KEY90085	Key	1
18	N/A	Impeller to case gap specification	N/A

VB002S, VB002

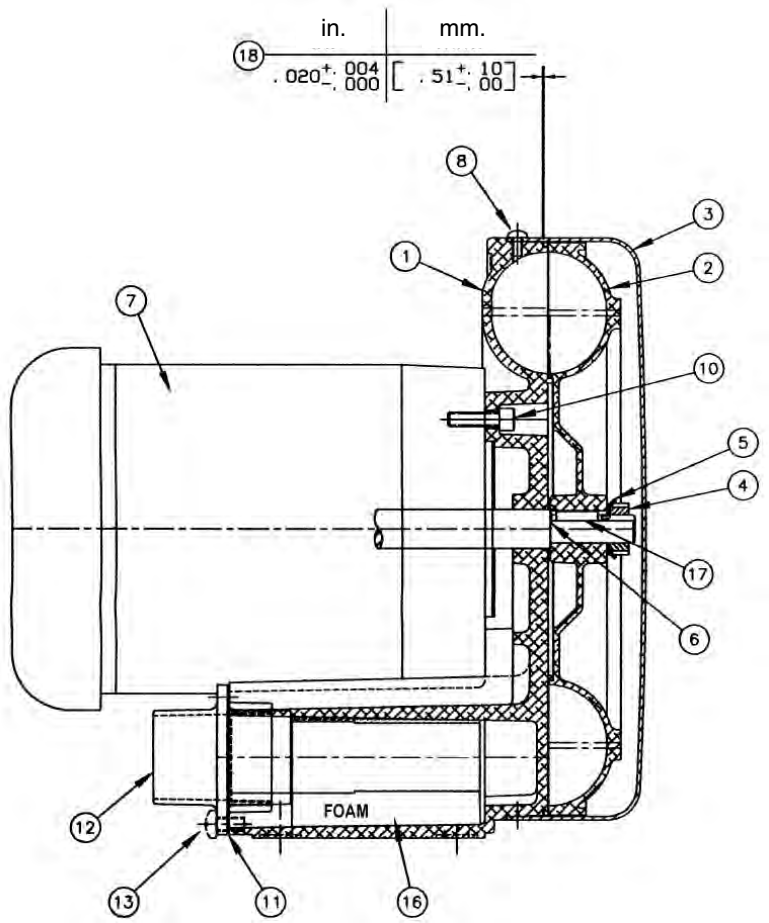
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB003S, VB003

Assembly Diagram

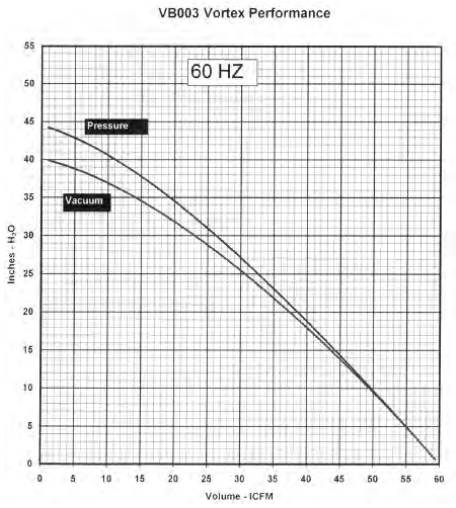


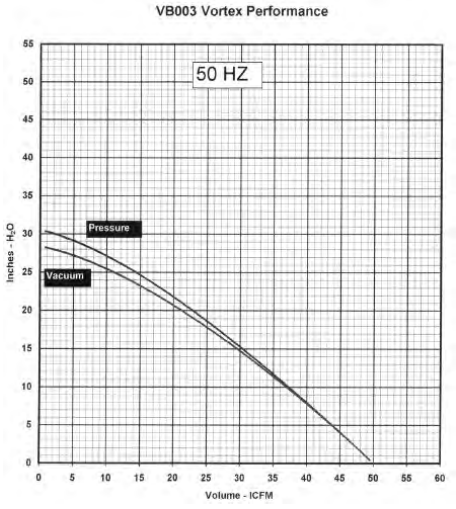
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB003S & VB003			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC90301	Case, Unibody	1
2	VBI90301	Impeller	1
3	VBE90301	Cover, Impeller	1
4	NUT90219	Locknut, Shaft	1
5	WSH90184	Lockwasher, Shaft	1
6	WSH90185	Shim, Shaft to Impeller (as required)	1
7	MOT90213	Motor 48C, 1/2 HP, 1PH, 50/60Hz	1
7A	MOT90214	Motor 48C, 1/2 HP, 3PH, 50/60Hz	1
7B	MOT90229	Motor 48C, 1/2 HP, 3PH, 575 Volt, 50/60Hz	1
7C	MOT90470	Motor 48C, 1/2 HP, 3PH, 60Hz	1
7D	MOT90469	Motor 48C, 1/2 HP, 1PH, 60Hz	1
8	SCR90901	M4 x 0.7 Pan Head Phillips Screw x .31 [8] Long	4
10	SCR90307	1/4-20 x .625" Long Socket Cap Screw	4
11	GSK90170	Gasket, Flange	1
12	FLC90015	Flange	1
13	SCR90888	M5 x 0.8 Hex Head Bolt x .63 [16] Long	6
16	INS90016	Absorber	2
17	KEY90085	Key	1
18	N/A	Impeller to case gap specification	N/A

VB003S, VB003

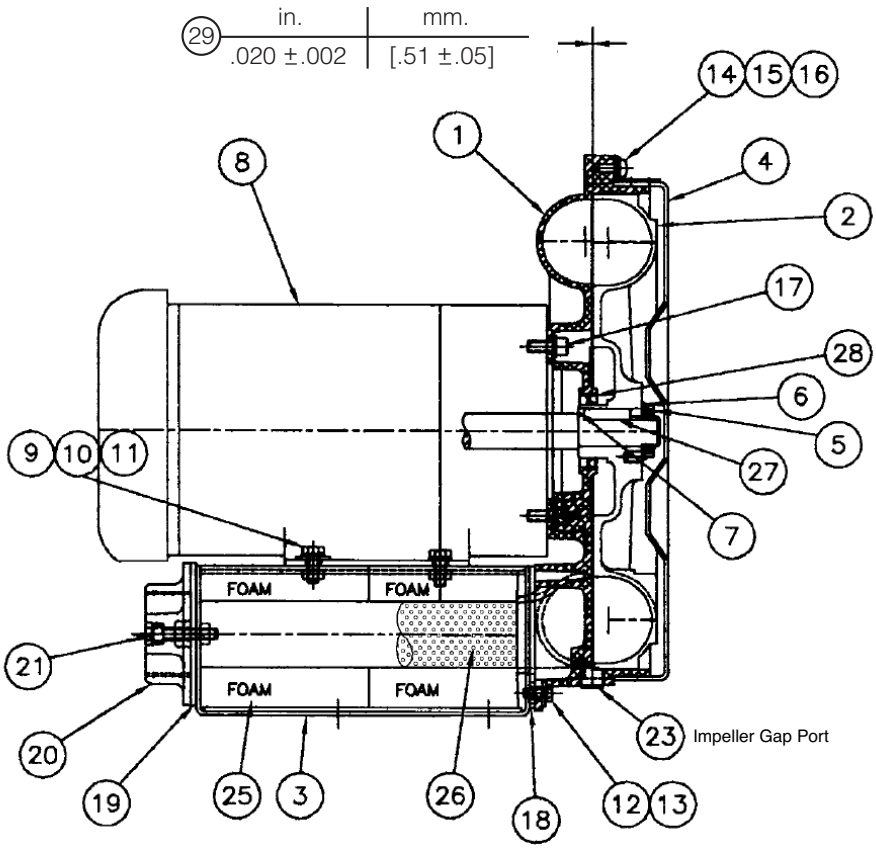
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB004S, VB004

Assembly Diagram

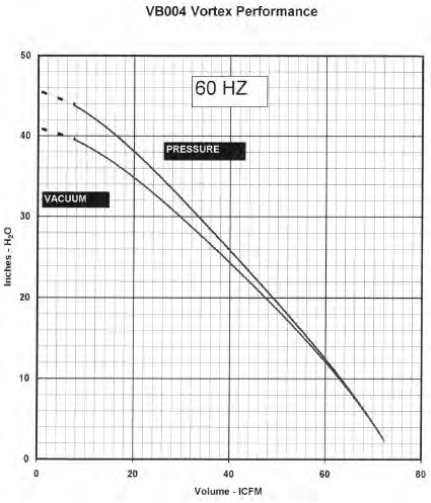


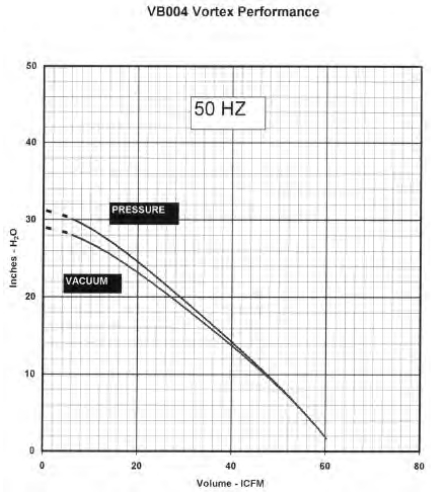
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB004S & VB004			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC90401	Case	1
2	VBI90401	Impeller	1
3	VBB90401	Base	1
4	VBE90401	Cover, Impeller	1
5	NUT90212	Locknut, Shaft	1
6	WSH90170	Lockwasher, Shaft	1
7	WSH90177	Shim, Shaft to Impeller (as required)	1
8	MOT90193	Motor 48C, 3/4 HP, 1PH, 50/60Hz	1
8A	MOT90192	Motor 48C, 3/4 HP, 3PH, 50/60Hz	1
8B	MOT90230	Motor 48C, 3/4 HP, 3PH, 575 Volt, 50/60Hz	1
8C	MOT90471	Motor 48C, 3/4 HP, 3PH, 60Hz	1
8D	MOT90472	Motor 48C, 3/4 HP, 1PH, 60Hz	1
9	SCR90887	M6 x 1.0 Hex Head Bolt x .63 [16] Long	4
10	WSH90142	Lock washer, M5	4
11	WSH90166	Flat Washer, M5	4
12	SCR90888	M5 x 0.8 Hex Head Bolt x .63 [16] Long	2
13	WSH90181	Flat Washer, M5	2
14	SCR90877	M5 x 0.8 Pan Head Phillips Screw x .39 [10] Long	4
15	WSH90138	Lockwasher, M5	4
16	WSH90139	Flat Washer, M5	4
17	SCR90307	1/4-20 x .625" Long Socket Cap screw	4
18	GSK90165	Gasket, Case	1
19	GSK90163	Gasket, Flange	2
20	FLC90007	Flange	2
21	SCR90931	M6 x 1.0 S.H.C.S. x .98 [25] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90017	Absorber	4
26	SCN90065	Screen	2
27	KEY90076	Key	1
28	SEL90108	Lip Seal	1
29	N/A	Impeller to case gap specification	N/A

VB004S, VB004

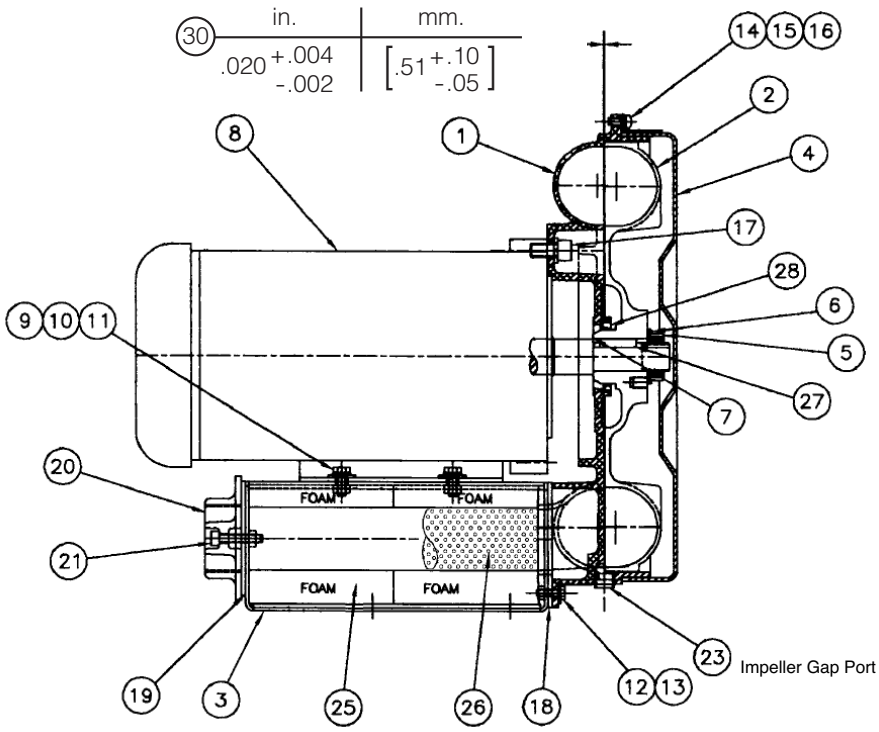
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB007S, VB007, VB007SXP, VB007XP

Assembly Diagram



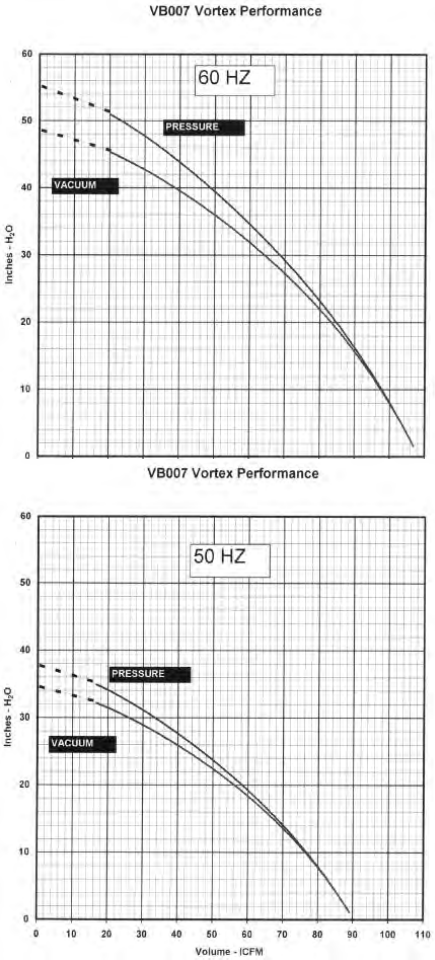
(See Bulletin 417, pages 34 and 35 for specifics on models with explosion-proof motors.)

Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB007S, VB007, VB007SXP, VB007XP			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC90701	Case	1
2	VBI90701	Impeller	1
3	VBB90701	Base	1
4	VBE90701	Cover, Impeller	1
5	NUT90210	Locknut, Shaft	1
6	WSH90171	Lockwasher, Shaft	1
7	WSH90160	Shim, Shaft to Impeller (as required)	1
8C	MOT90225	Motor, 56C, 1-1/2 HP, 3PH, XP, 50/60Hz	1
8D	MOT90358	Motor, 56C, 1-1/2 HP, 1PH, XP, 50/60Hz	1
8G	MOT90248	Motor, 56C, 1-1/2 HP, 3PH, 50/60Hz	1
8H	MOT90253	Motor, 56C, 1-1/2 HP, 1PH, 50/60Hz	1
8I	MOT90485	Motor, 56C, 1-1/2 HP, 3PH, 60Hz	1
8J	MOT90484	Motor, 56C, 1-1/2 HP, 1PH, 60Hz	1
9	SCR90887	M6 x 1.0 Hex Head Bolt x .63 [16] Long	4
10	WSH90142	Lockwasher, M6	4
11	WSH90166	Flat Washer, M6	4
12	SCR90888	M5 x 0.8 Hex Head Bolt x .63 [16] Long	2
13	WSH90181	Washer, Flat M5	2
14	SCR90877	M5 x 0.8 Pan Head Phillips Screw x .39 [10] Long	4
15	WSH90138	Lockwasher, M5	4
16	WSH90139	Flat Washer, M5	4
17	SCR90867	3/8-16 x .75" Long Socket Cap Screw	4
18	GSK90164	Gasket, Case	1
19	GSK90163	Gasket, Flange	2
20	FLC90008	Flange, 1 1/2 FNPT	2
21	SCR90931	M6 x 1.0 S.H.C.S. x .98 [25] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90018	Absorber	4
26	SCN90064	Screen	2
27	KEY90076	Key	1
28	SEL90107	Lip Seal	1
30	N/A	Impeller to case gap specification	N/A

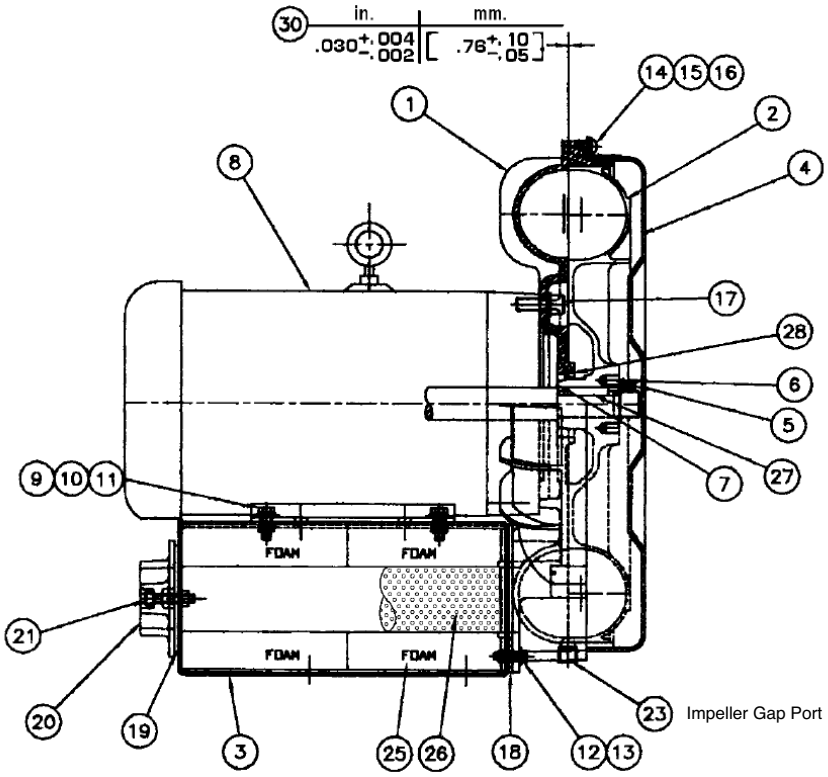
VB007S, VB007

Performance Curves



Spencer® Vortex® Regenerative Blowers
VB019S, VB019, VB019SXP, VB019XP

Assembly Diagram



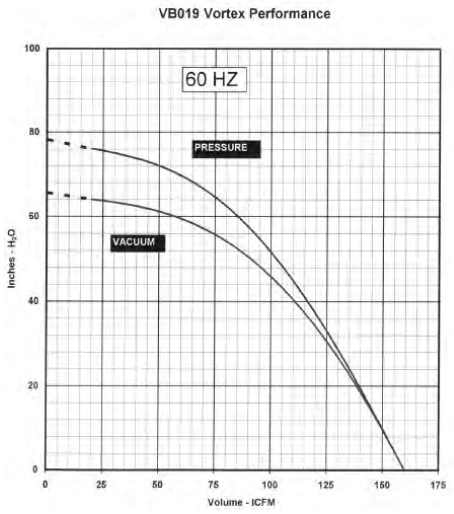
(See Bulletin 417, pages 36 and 37 for specifics on models with explosion-proof motors.)

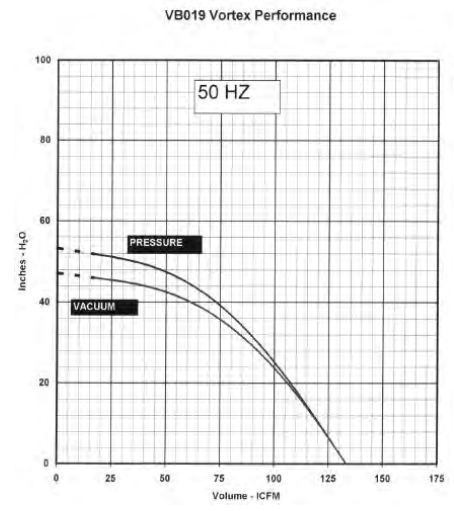
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB019S, VB019, VB019SXP, VB019XP			
ITEM	PART NO.	DESPCRIPTION	QTY.
1	VBC91901	Case	1
2	VBI91901	Impeller	1
3	VBB91901	Base	1
4	VBE91901	Cover, Impeller	1
5	NUT90210	Locknut, Shaft	1
6	WSH90171	Lockwasher, Shaft	1
7	WSH90160	Shim, Shaft to Impeller (as required)	1
8	MOT90254	Motor, 145TC, 2-1/2 HP, 1PH, 50/60Hz	1
8A	MOT90249	Motor, 145TC, 2-1/2 HP, 3PH, 50/60Hz	1
8B	MOT90347	Motor, 145TC, 2-1/2 HP, 3PH, 575 Volt, 50/60Hz	1
8C	MOT90224	Motor, 145TC, 2-1/2 HP, 3PH, XP, 50/60Hz	1
8D	MOT90359	Motor, 145TC, 2-1/2 HP, 1PH, XP, 50/60Hz	1
8E	MOT90476	Motor, 145TC, 2-1/2 HP, 3PH, 60Hz	1
8F	MOT90475	Motor, 145TC, 2-1/2 HP, 1PH, 60Hz	1
9	SCR90887	M6 x 1.0 Hex Head Bolt x .63 [16] Long	4
9ALT	SCR90876	M6. x 1.0 Hex Head Bolt x .98 [25] Long (Cast Motor)	4
10	WSH90142	Lockwasher, M6	4
11	WSH90166	Flat Washer, M6	4
12	SCR90943	M5 x 0.8 Hex Head Bolt x .79 [20] Long	2
13	WSH90181	Flat Washer, M5	2
14	SCR90877	M5 x 0.8 Pan Head Phillips Screw x .39 [10] Long	4
15	WSH90138	Lockwasher, M5	4
16	WSH90139	Flat Washer, M5	4
17	SCR90867	3/8-16 x .75" Long Socket Cap Screw	4
18	GSK90162	Gasket, Case	1
19	GSK90163	Gasket, Flange	2
20	FLC90008	Flange, 1 1/2 FNPT	2
21	SCR90931	M6 x 1.0 S.H.C.S. x .98 [25] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90019	Absorber	4
26	SCN90063	Screen	2
27	KEY90077	Key	1
28	SEL90107	Lip Seal	1
30	N/A	Impeller to case gap specification	N/A

VB019S, VB019

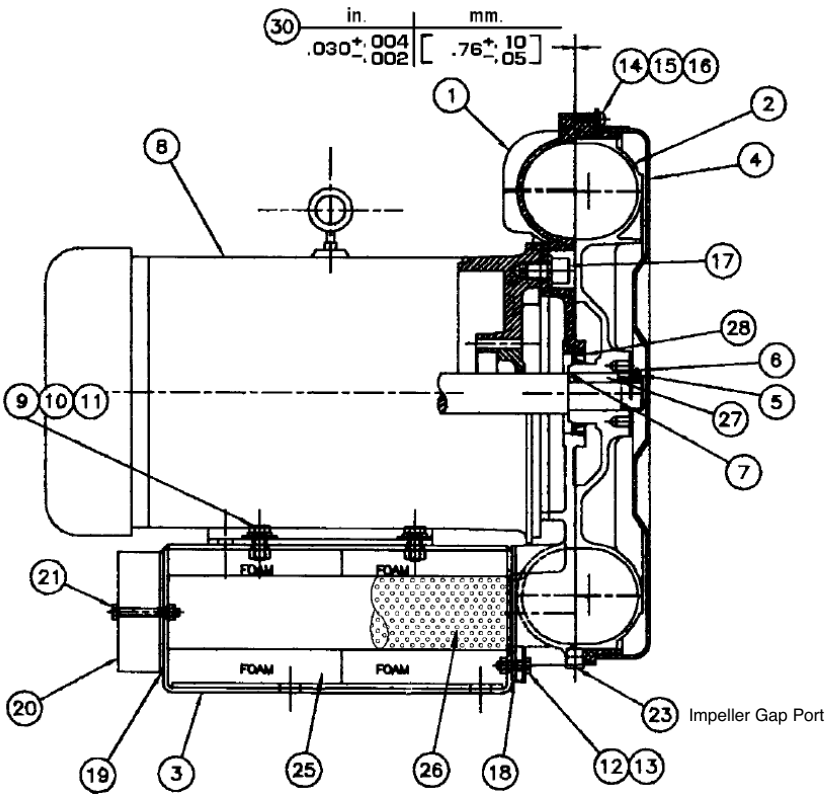
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB030S, VB030, VB030XP

Assembly Diagram



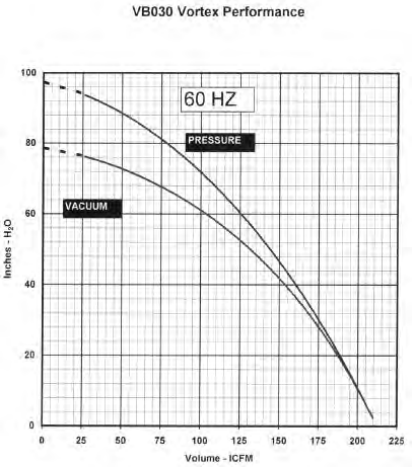
(See Bulletin 417, pages 38 and 39 for specifics on models with explosion-proof motors.)

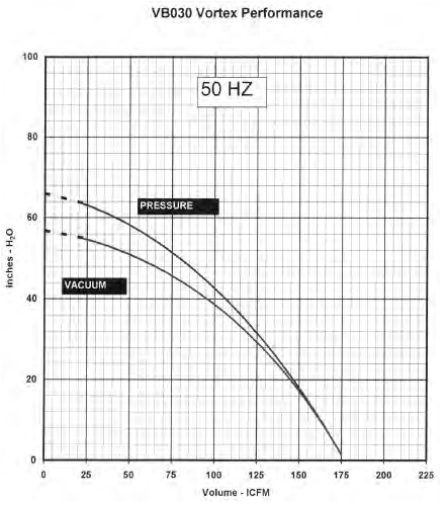
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB030S, VB030, VB030XP			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC93001	Case	1
2	VBI93001	Impeller	1
3	VBB93001	Base	1
4	VBE93001	Cover, Impeller	1
5	NUT90209	Locknut, Shaft	1
6	WSH90172	Lockwasher, Shaft	1
7	WSH90157	Shim, Shaft to Impeller (as required)	1
8	MOT90370	Motor, 184TC, 4 HP, 1PH, 50/60Hz	1
8A	MOT90250	Motor, 182TC, 4 HP, 3PH, 50/60Hz	1
8B	MOT90348	Motor, 182TC, 4 HP, 3PH, 575 Volt, 50/60Hz	1
8C	MOT90223	Motor, 182TC, 4 HP, 3PH, XP, 50/60Hz	1
8D	MOT90478	Motor, 182TC, 4 HP, 3PH, 60Hz	1
8E	MOT90477	Motor, 182TC, 4 HP, 1PH, 60Hz	1
9	SCR90879	M8 x 1.25 Hex Head Bolt x .98 [25] Long	4
10	WSH90148	Lockwasher, M8	4
11	WSH90182	Flat Washer, M8	4
12	SCR90876	M6 x 1.0 Hex Head Bolt x .98 [25] Long	2
13	WSH90166	Flat Washer, M6	2
14	SCR90877	M5 x 0.8 Pan Head Phillips Screw x .39 [10] Long	4
15	WSH90138	Lockwasher, M5	4
16	WSH90139	Flat Washer, M5	4
17	SCR90335	1/2 -13 x 1.0 Long Socket Cap Screw	4
18	GSK90161	Gasket, Case	1
19	GSK90155	Gasket, Flange	2
20	FLC90009	Flange, 2 FNPT	2
21	SCR90878	M6 x 1.0 Hex Head Bolt x 1.57 [40] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90020	Absorber	4
26	SCN90062	Screen	2
27	KEY90078	Key	1
28	SEL90104	Lip Seal	1
30	N/A	Impeller to case gap specification	N/A

VB030S, VB030

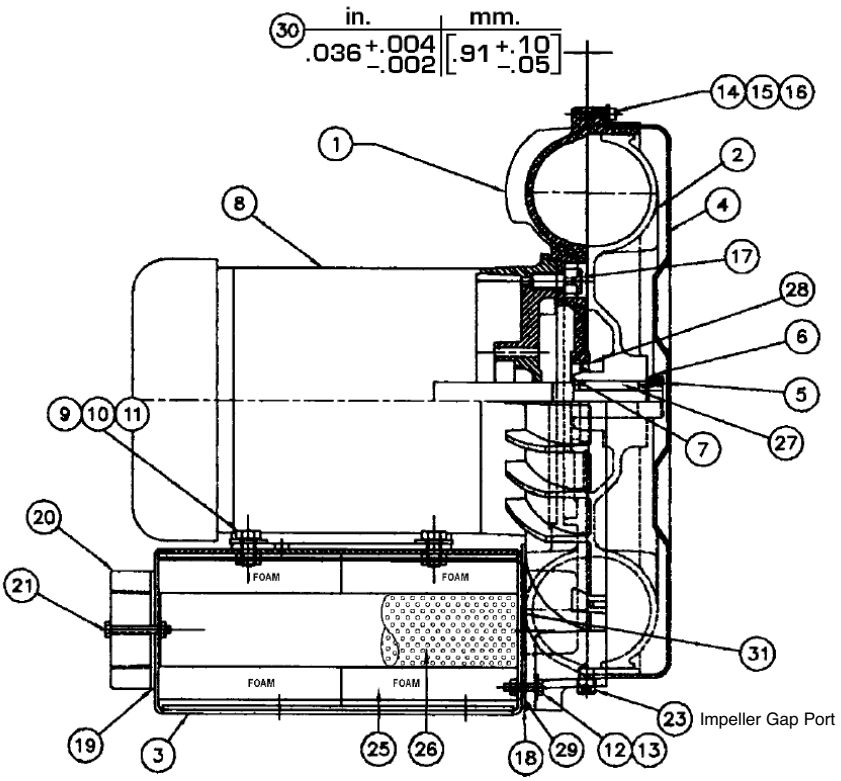
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB037S, VB037, VB037XP

Assembly Diagram



(See Bulletin 417, pages 40 and 41 for specifics on models with explosion-proof motors.)

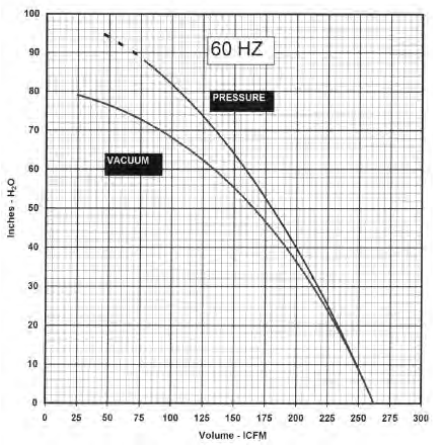
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB037S, VB037, VB037XP			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC93701	Case	1
2	VBI93702	Impeller	1
3	VBB93700	Base	1
4	VBE93701	Cover, Impeller	1
5	NUT90209	Locknut, Shaft	1
6	WSH90172	Lockwasher, Shaft	1
7	WSH90157	Shim, Shaft to Impeller (as required)	1
8	MOT90361	Motor, 184TC, 5 HP, 1PH, 50/60Hz	1
8A	MOT90181	Motor, 184TC, 5 HP, 3PH, 50/60Hz	1
8B	MOT90234	Motor, 184TC, 5 HP, 3PH, 575 Volt, 50/60Hz	1
8C	MOT90222	Motor, 184TC, 5 HP, 3PH, XP, 50/60Hz	1
8D	MOT90480	Motor, 184TC, 5 HP, 3PH, 60Hz	1
8E	MOT90479	Motor, 184TC, 5 HP, 1PH, 60Hz	1
9	SCR90879	M8 x 1.25 Hex Head Bolt x .98 [25] Long	4
10	WSH90148	Lockwash, M8	4
11	WSH90182	Flat Washer, M8	4
12	SCR90878	M6 x 1.0 Hex Head Bolt x 1.57 [40] Long	2
13	WSH90166	Flat Washer, M6	2
14	SCR90877	M5 x 0.8 Pan Head Phillips Screw x .39 [10] Long	4
15	WSH90138	Lockwasher, M5	4
16	WSH90139	Flat Washer, M5	4
17	SCR90335	1/2-13 x 1.0 Long Socket Cap Screw	4
18	GSK90154	Gasket, Case	1
19	GSK90155	Gasket, Flange	2
20	FLC90009	Flange, 2 FNPT	2
21	SCR90878	M6 x 1.0 Hex Head Bolt x 1.57 [40] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90021	Absorber	4
26	SCN90056	Absorber Screen	2
27	KEY90079	Key	1
28	SEL90104	Lip Seal	1
29	SPR90088	Spacer, Washer (Case to Base)	2
30	N/A	Impeller to case gap specification	N/A
31	PLC90027	Plate, Case	1

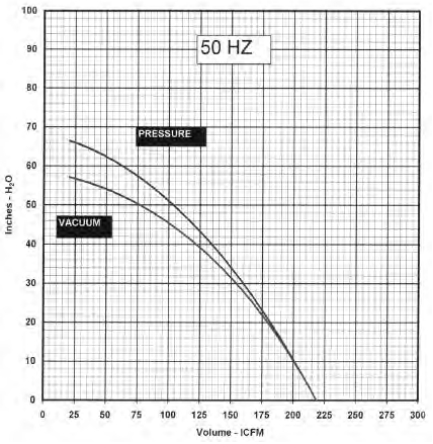
VB037S, VB037

Performance Curves

VB037 Vortex Performance

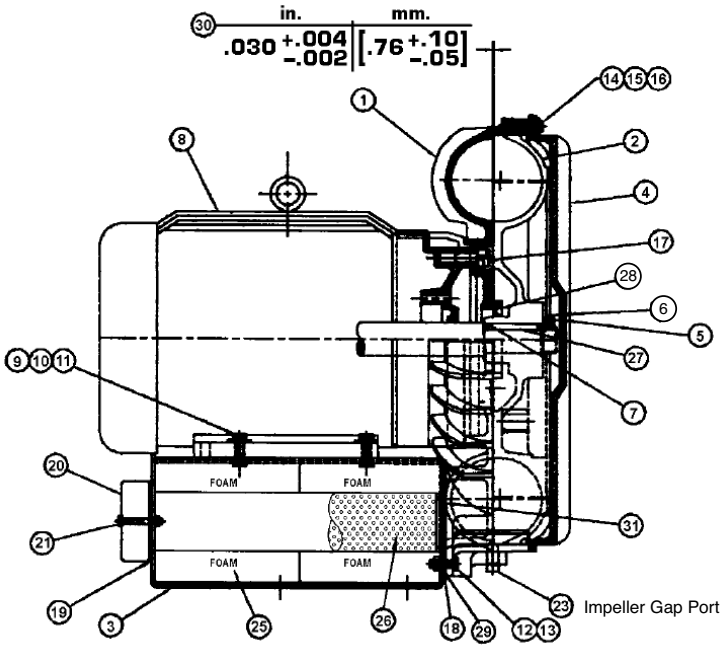


VB037 Vortex Performance



Spencer® Vortex® Regenerative Blowers
VB055, VB055XP

Assembly Diagram



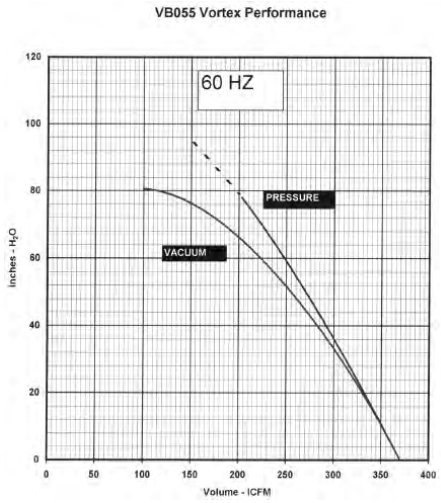
(See Bulletin 417, pages 42 and 43 for specifics on models with explosion-proof motors.)

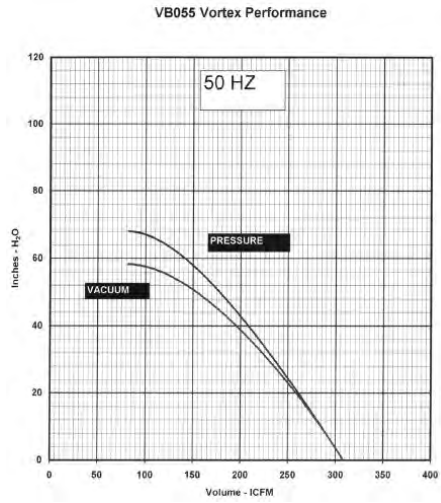
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB055, VB055XP			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC95501	Case	1
2	VBI95502	Impeller	1
3	VBB95501	Base	1
4	VBE95501	Cover, Impeller	1
5	NUT90211	Locknut, Shaft	1
6	WSH90173	Lockwasher, Shaft	1
7	WSH90154	Shim, Shaft to Impeller (as required)	1
8	MOT90182	Motor, 213TC, 7-1/2 HP, 3PH, 50/60Hz	1
8A	MOT90205	Motor, 213TC, 7-1/2 HP, 3PH, 575 Volt, 50/60Hz	1
8B	MOT90221	Motor, 213TC, 7-1/2 HP, 3PH, XP, 50/60Hz	1
8C	MOT90481	Motor, 213TC, 7-1/2 HP, 3PH, 60Hz	1
9	SCR90881	M8 x 1.25 Hex Head Bolt x 1.18 [30] Long	4
10	WSH90148	Lockwasher, M8	4
11	WSH90182	Flat Washer, M8	4
12	SCR90895	M8 x 1.25 Hex Head Bolt x 1.57 [40] Long	2
13	WSH90182	Flat Washer, M8	2
14	SCR90876	M6 x 1.0 Hex Head Screw x .98 [25] Long	8
15	WSH90143	Lockwasher, M6	8
16	WSH90142	Washer, Flat M6	8
17	SCR90335	1/2-13 x 1.0 Long Socket Cap Screw	4
18	GSK90156	Gasket, Case	1
19	GSK90157	Gasket, Flange	2
20	FLC90010	Flange, 2-1/2 FNPT	2
21	SCR90878	M6 x 1.0 Hex Head Bolt x 1.57 [40] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90022	Absorber	4
26	SCN90057	Absorber Screen	2
27	KEY90080	Key	1
28	SEL90105	Lip Seal	1
30	N/A	Impeller to case gap specification	N/A
31	PLC90028	Case Plate	1

VB055

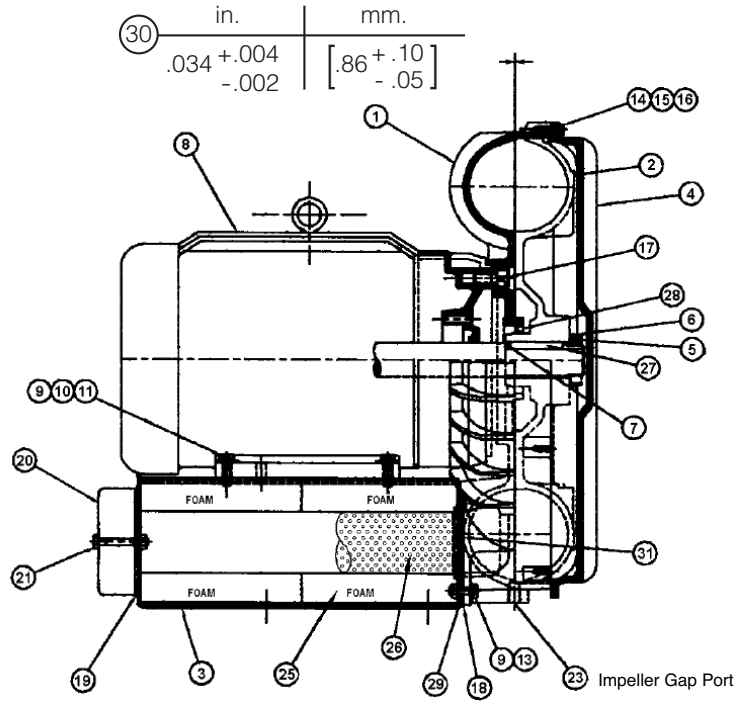
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB075, VB075XP

Assembly Diagram



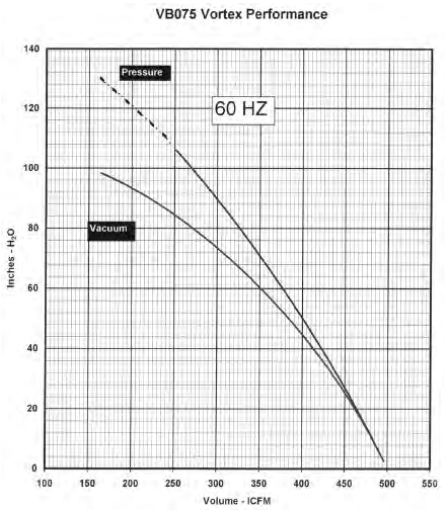
(Contact factory for specifics on models with explosion-proof motor.)

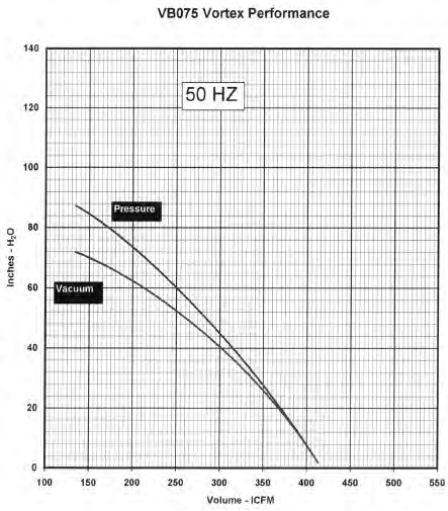
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB075, VB075XP			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC97501	Case	1
2	VBI97502	Impeller	1
3	VBB97501	Base	1
4	VBE97501	Cover, Impeller	1
5	NUT90213	Locknut, Shaft	1
6	WSH90174	Lockwasher, Shaft	1
7	WSH90179	Shim, Shaft to Impeller (as required)	1
8	MOT90199	Motor, 215TC, 10 HP, 3PH, 50/60Hz	1
8A	MOT90235	Motor, 215TC, 10 HP, 3PH, 575 Volt, 50/60Hz	1
8B	MOT90220	Motor, 215TC, 10 HP, 3PH, XP, 50/60Hz	1
8C	MOT90482	Motor, 215TC, 10 HP, 3PH, 60Hz	1
9	SCR90881	M8 x 1.25 Hex Head Bolt x 1.18 [30] Long	4
10	WSH90148	Lockwasher, M8	4
11	WSH90182	Flat Washer M8	4
12	SCR90881	M8 x 1.25 Hex Head Bolt x 1.18 [30] Long	2
13	WSH90182	Flat Washer M8	2
14	SCR90876	M6 x 1.0 Hex Head Screw x .98 [25] Long	8
15	WSH90143	Lockwasher, M6	8
16	WSH90142	Flat Washer M6	8
17	SCR90335	1/2-13 x 1.0 Long Socket Cap Screw	4
18	GSK90158	Gasket, Case	1
19	GSK90159	Gasket, Flange	2
20	FLC90011	Flange, 3 FNPT	2
21	SCR90883	M8 x 1.25 Hex Head Bolt x 2.165 [55] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90023	Absorber	4
26	SCN90058	Absorber Screen	2
27	KEY90081	Key	1
28	SEL90106	Lip Seal	1
29	SPR90089	Spacer, Washer (Case to Base)	2
30	N/A	Impeller to case gap specification	N/A
31	PLC90029	Case Plate	1

VB075

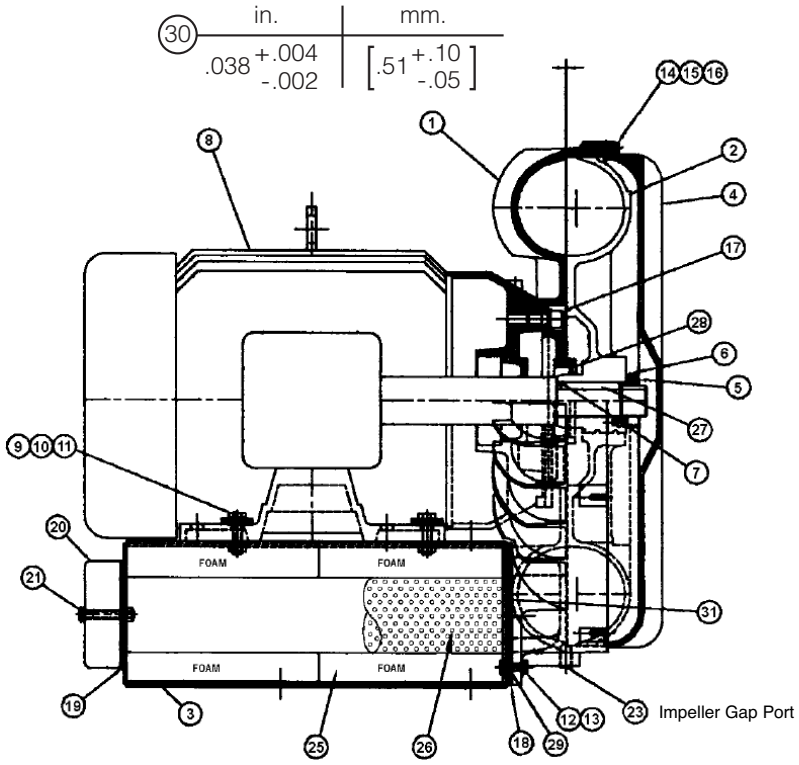
Performance Curves





Spencer® Vortex® Regenerative Blowers
VB110, VB110XP

Assembly Diagram



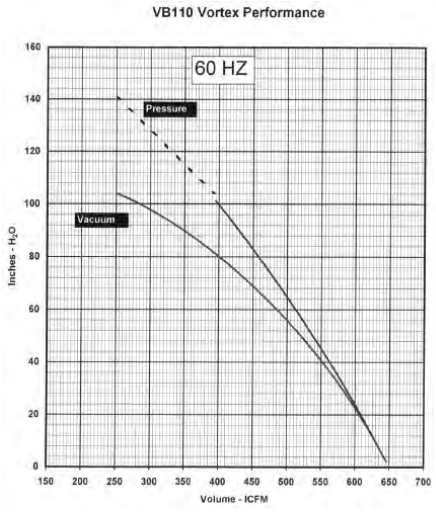
(Contact factory for specifics on models with explosion-proof motor.)

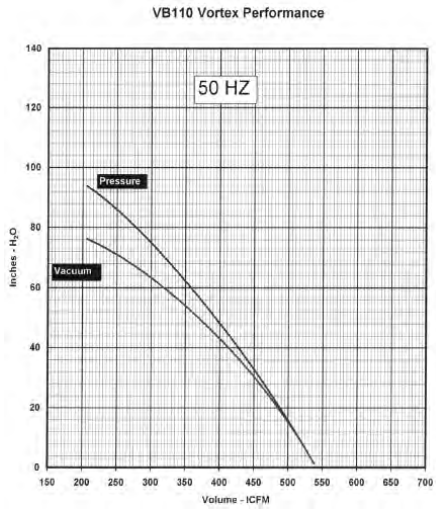
Parts List

DESCRIPTION: VORTEX BLOWER ASSEMBLY – VB110, VB110XP			
ITEM	PART NO.	DESCRIPTION	QTY.
1	VBC91101	Case	1
2	VBI91102	Impeller	1
3	VBB91101	Base	1
4	VBE91101	Cover, Impeller	1
5	NUT90213	Locknut, Shaft	1
6	WSH90174	Lockwasher, Shaft	1
7	WSH90179	Shim, Shaft to Impeller (as required)	1
8	MOT90200	Motor, 254-6TC, 15 HP, 3PH, 50/60Hz	1
8A	MOT90236	Motor, 254-6TC, 15 HP, 3PH, 575 Volt, 50/60Hz	1
8B	MOT90219	Motor, 254TC, 15 HP, 3PH, XP, 50/60Hz	1
8C	MOT90483	Motor, 254TC, 15 HP, 3PH, 60Hz	1
9	SCR90882	M10 x 1.5 Hex Head Bolt x 1.57 [40] Long	4
10	WSH90137	Lockwasher, M10	4
11	WSH90183	Flat Washer M10	4
12	SCR90881	M8 x 1.25 Hex Head Bolt x 1.18 [30] Long	2
13	WSH90182	Flat Washer M8	2
14	SCR90876	M6 x 1.0 Hex Head Screw x .98 [25] Long	8
15	WSH90143	Lockwasher, M6	8
16	WSH90142	Flat Washer M6	8
17	SCR90335	1/2-13 x 1.0 Long Socket Cap Screw	4
18	GSK90160	Gasket, Case	1
19	GSK90159	Gasket, Flange	2
20	FLC90011	Flange, 3 FNPT	2
21	SCR90883	M8 x 1.25 Hex Head Bolt x 2.16 [55] Long	4
23	PLG90037	Plug, 1/4 NPT x .43 [11] Long	1
25	INS90024	Absorber	4
26	SCN90061	Absorber Screen	2
27	KEY90082	Key	1
28	SEL90106	Lip Seal	1
29	SPR90089	Spacer, Washer (Case to Base)	2
30	N/A	Impeller to case gap specification	N/A
31	PLC90030	Case Plate	1

VB110

Performance Curves





VI. Troubleshooting Guide

Trouble	Possible Cause	Corrective Action
Blower Does Not Turn and there is -		
A Humming Sound	– One phase of power line disconnected	Connect power leads properly
	– One phase of stator line open	Contact factory
	– Bearing(s) defective	Change defective bearing(s)
	– Impeller jammed by foreign material	Clean impeller
	– Impeller jammed against casing or side cover	Adjust gap
	– Rubbing of rotor core and stator core	Contact factory
	– Capacitor open (single-phase models)	Change capacitor
No Sound	– Two phases of power line disconnected	Connect power leads properly
	– Two phases of stator winding open	Contact factory
	– Faulty switch connection	Change switch
	– Fuse blown	Change fuse
Blower Turns, but -		
Fuse Blows	– Fuse capacity insufficient, wiring fault	Inspect wiring
	– Short circuit	Repair
	– Terminals shorted	Improve insulation and check connections
	– Excessive load	Increase air flow
Overheats or Thermal Protector Activates	– Power source unbalance; possible voltage drop	Check voltage; phases must be balanced within 5% and voltage must be within 10% of rated
	– Operating in single-phase condition	Check connections
	– Excessive friction due to defective bearings	Replace bearings
	– Impeller contaminated by foreign material	Clean impeller
	– Impeller rubbing against casing or side cover	Adjust gap
	– Operation at less than minimum rated flow	Increase air flow
	– Inlet air filter clogged	Clear or replace element
Makes Abnormal or Excessive Sound	– Impeller rubbing against casing or side cover	Adjust gap
	– Impeller rubbed by foreign material	Clean impeller
	– Bearing(s) defective	Replace bearings
	– There is a leak or air passages are clogged	Repair or clean
	– Loose cap screw	Tighten screw
	– Air channel noise absorber foam damaged	Replace absorbers

Customer Maintenance Log

DATE	PROCEDURE	COMMENTS	INITIALS

Spencer Corporate Headquarters and Manufacturing Plant, Windsor, CT USA

Spencer®

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Industrially rated products offering effective solutions for air and gas handling problems:

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